# BROOKLYN BOTANIC GARDEN

# RECORD

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EDITED BY
C. STUART GAGER

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# BROOKLYN BOTANIC GARDEN

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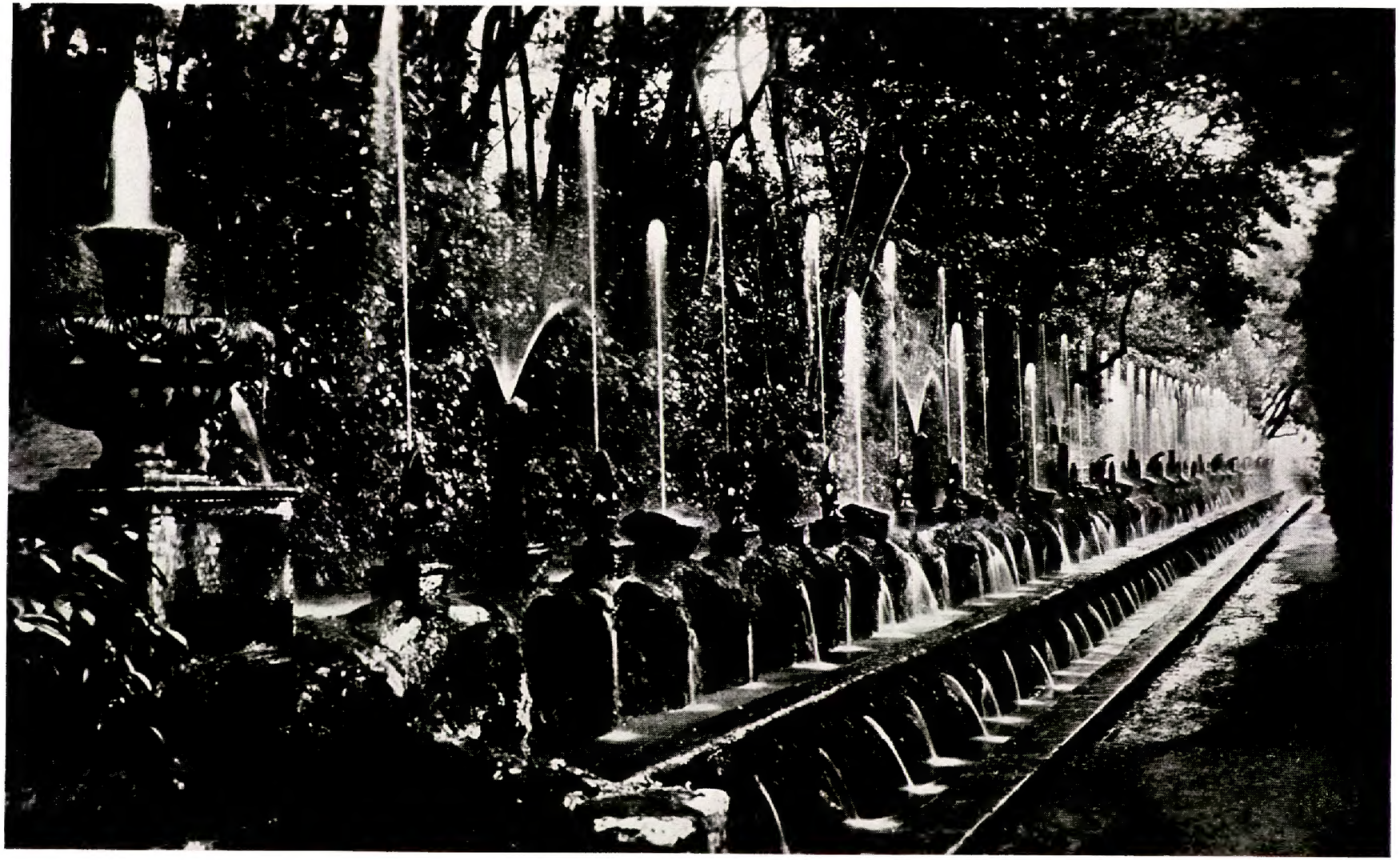

FIG. 14. Villa d'Este, Tivoli. Viale delle Cento Fontane. (6977.)

BROOKLYN
BOTANIC GARDEN
# RECORD

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## REPORT ON A EUROPEAN TRIP OF THE DIRECTOR

To the Botanic Garden Governing Committee:

At its meeting on April 22, 1930, the Governing Committee authorized the director, as a delegate from the Brooklyn Botanic Garden, to attend the International Horticultural Congress in London, August 7–15, and the Fifth International Botanical Congress in Cambridge, England, August 16–23. The trip was planned so as also to afford opportunity to visit a number of European botanic gardens.

Leaving New York by S. S. Lapland on Friday p.m., July 11, I landed at Cherbourg on Sunday, the 20th, and proceeded *via* Paris to Berne, inspecting the botanic garden there on July 21. This garden is located on a sloping terrace overlooking the River Aare, and the planting is laid out on the systematic basis. Professor Dr. Ed. Fischer has been the director for over twenty-five years. The Botanischer Garten and Botanisches Institut are departments of the Hochschule Bern and the garden, like our own, renders a valuable service to the local schools in the supply of study material, and also encourages the visits of classes with their teachers. The alpine section is an important feature, and the Garden has a cooperative agreement with the *Alpengarten Schynige Platte* by the terms of which the former has charge of the scientific and horticultural work. Several specimens of Yew (*Taxus baccata*) growing spontaneously in a dry wall and in natural cracks of a rock, along the northwest side of the garden are of much interest. The trees are many years old, and the sowing of the seeds in the

cracks of the wall have been attributed by Dr. R. Stäger to nuthatches (*Sitta caesia*).

The Swiss botanist, De Candolle, once wrote: "C'est à cette Italie, à laquelle l'Europe doit presque toutes ses meilleures institutions, qu' elle doit aussi les Jardins de Botanique." And so it is; for the oldest existing botanic gardens are in Italy. It was Italian universities that first developed botanic gardens as a part of their botanical departments, primarily to facilitate the teaching of botany. These gardens are, therefore, today of great historical importance and interest. The Italian itinerary follows.

## Italian Botanic Gardens

From Berne we proceeded to Padua *via* Milan. The public garden at Milan is locally commonly called a botanic garden. It contains many very beautiful but unlabeled trees, and the place serves only as a public park.

## Padua

The Reàle Orto Botanico di Padova, next visited, is perhaps the oldest existing botanic garden in the world, having been established on the site where it now is, by a decree of the Republic of Venice of June 29, 1545. It was here that Pier Andrea Saccardo, the most noted systematic mycologist of modern times, did his work while director from 1878 until his death, February 12, 1920. Saccardo's herbarium is now the priceless possession of this garden. Here also is found the oldest plant under cultivation in a botanic garden in the world—a specimen of the Chaste Tree (*Vitex Agnus-castus*). This tree was planted in 1550, five years after the garden was established, and is therefore 380 years old. It is 1.8 meters in circumference. Here are the historically interesting "Palma di Goethe"—*Chamaerops humilis* (about 310 years old and 10 meters high), and the "Bignonia di Goethe" (about 135 years old and 8 meters high). These plants were studied by the poet Goethe in the preparation of his philosophico-botanical work, *Die Metamorphosen der Pflanzen.*

The first Magnolia grown in Italy is at Padua, as are also a Deodar (*Cedrus Deodara*) 100 years old, and a fine specimen of the California Big Tree (*Sequoia gigantea*), planted in 1850, and

a large *Araucaria excelsa,* planted in 1840, pressing against the roof of a glass house built specially for it and containing nothing else. Also an interesting specimen of the Maidenhair Tree (*Ginkgo biloba*), planted in 1750 and with a large pistillate branch

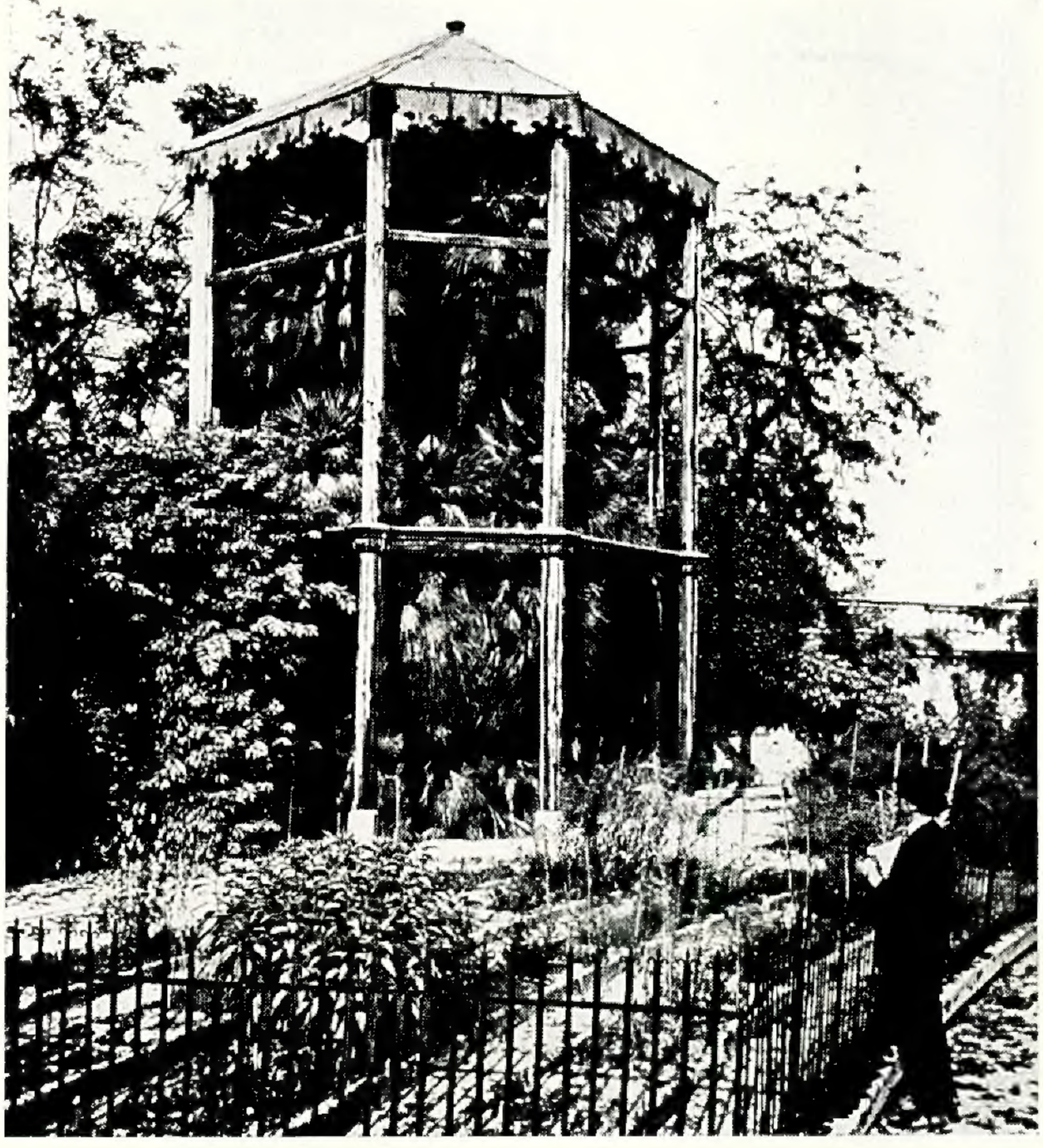

FIG. 15. Padua. R. Orto Botanico. Goethe's Palm (*Chamaerops humilis*), planted in 1585. The palm is completely enclosed in the glass house in winter. (6971.)

grafted onto the staminate trunk, thus bearing both kinds of flowers, and so artificially monoecious. This garden is affiliated with the University of Padua, and the present director is Professor Giuseppe Gola.

At the Padua Garden is one of the largest known collections of portraits of botanists, dating from the first half of the thirteenth century. John Evelyn, the Diarist and author of the famous *Silva* (London, 1664), studied here in 1643, and we may note, in passing, that Padua (the ancient Patavium) was the birthplace of the Roman historian, Livy.

## Bologna

The botanic garden at Bologna, next visited, was established by the Senate of Bologna in 1567 under the initiative of Ulissi Aldrovandi (1522–1605), who was made its first director and so continued for 38 years (1567–1605). He was a pupil of Ghini. The present director of the garden is Professor L. Buscalioni. On the wall of the botanical lecture room of the University of Bologna is the following quotation from the Philosophical Botany of Linnaeus: *Methodus naturalis ultimus finis botanices est et erit.*

## Florence

In Florence, next visited, there are, in addition to the Botanic Gardens, the Reale Instituto Forestale di Villombrosa, the Arboreto Tozzie Siemoni, and the Gardino Boboli, famous for its topiary work. Unfortunately these gardens were closed during our very brief stay in Florence, but since the accounts of the founding of the Florence garden, as given by different writers, have not always been easy to harmonize (especially with reference to Ghini and the Pisa garden), it seems best to give a brief summary here, for which I have drawn fully on Saccardo's *La Botanica in Italia.*

Cosmo I entrusted the foundation of a botanic garden to Luca Ghini. There are no official documents by which the exact date may be fixed, but Ghini was lecturer on simples in Pisa in 1544 and founded that garden in 1547. The Florence garden is known to have been in existence in 1557, having been planted in the vicinity of San Marco. Subsequently it was neglected, but in 1718 it was flourishing again under the care of the botanical society of Florence. That society united with the Academy of Agriculture in 1783, and the garden became transformed into an agricultural experiment garden. Some years before (in 1737) Giovanni Targioni-Tozzetti created a chair of botany at the natural history museum, and a portion of the Boboli garden was annexed to the botanic garden. At that time the old botanic garden of San Marco became again a garden of simples. In 1883 the agricultural experiment garden was converted into an educational botanic garden, and shortly thereafter the botanical museum of Boboli was moved to the new San Marco building.

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## Rome

The director of the Reàle Orto Botanico and of the Instituto Botanico of the University of Rome is Prof. Enrico Carano. It was not easy to find this garden. In many European cities the

FIG. 16. Padua. R. Orto Botanico. Chaste Tree (*Vitex Agnus-castus*), planted in 1550. The oldest known plant growing in any botanic garden in the world. (6967.)

words "Botanic Garden" or their equivalent in the language of the country, mean "Public Garden," and sometimes the taxicab driver, accustomed to sight-seeing tourists, cannot quite believe that one really wishes the botanic garden, which commonly holds little of interest for the average "tripper." So when we said "Orto Botanico" to the taxi driver in Rome he said "Sì," and

FIG. 17. Padua. R. Orto Botanico. Herbaceous beds. The highest tree in the central background is a Norfolk Island Pine (*Araucaria excelsa*). (6969.)

promptly took us to the Borghesi Gardens, quite like one of our American public parks, and devoid of anything of botanical interest. We then showed him a map of the city of Rome, such as is commonly on sale in the city, and pointed to the words "BOTANICAL GARDENS," printed in large and small capital letters, near the Coliseum. Shortly we drove up to that place, only to find a vacant and abandoned lot, in which were growing a few half dead trees, and various weeds. Inquiry from policemen and facisti (who were everywhere) and from proprietors of stores and others

brought no information except how to reach the Borghesi Gardens! Before starting out another day we found that the entrance to the Orto Botanico is at via Milano 75. This garden, of 5 hectares in area, was given to the city of Rome about 47 years ago by Prince Corsini. It is the direct descendant of the first scientific garden established at Rome in 1566 by Michele Mercati, probably under the guidance of his teacher and friend Cesalpino, who, in turn, was a pupil of Ghini.

A school for the training of gardeners was started here in 1927 by the head gardener (*capa technica*), Oronato Traverso, who graciously acted as our guide. About 50 pupils are now enrolled, and the first class graduated this year. Tuition is gratis, and the director of the school is Prof. Bruno Braschi. The garden is laid out on the systematic plan, and contains an old 15th Century fountain.

## Villa d'Este

In addition to the botanic garden, the Villa d'Este (now a public monument) was also visited. As is well known, this Renaissance Villa includes one of the most lovely gardens in the world, probably being unequalled in its elaborate and almost unbelievably beautiful development of fountains. These were made possible by constructing a subterranean canal under the city of Tivoli, thus supplying the garden with an almost unlimited quantity of water from the river Aniene (Anio). This supply was supplemented by an aqueduct which carried additional water over the mountains. The planting is so arranged as to form a perfect setting for the fountains and statues. One can hardly believe his eyes as, spellbound, he beholds this richness of beauty and loveliness. The designer was G. Alberto Galvani. The Brooklyn Botanic Garden library has enlarged views of the Villa in Forbes' *Architectural Gardens of Italy*, presented to the library last year by Miss Louise and Mr. Charles Dreyer, of Brooklyn.

## Naples

The botanic garden of Naples, with an area of about 13 hectares is beautifully situated on a sloping site. The laboratory buildings were badly cracked by the earthquake which occurred only a few days before our visit. New buildings are expected in the near

future. Emphasis is placed on the section of medicinal plants, used in connection with the instruction of classes in pharmacy and medicine. A "garden of simples" existed in Naples as early as 1662. The establishment of the real *botanic* garden of the present was decreed in 1796, but was not actually begun until 1809, under the direction of Michele Tenove, who continued as its director from 1810 to 1860. The largest section is the arboretum.

## Pisa

The garden next visited was the Reàle Orto Botanico della R. Università di Pisa. Whether the Padua or the Pisa garden is the older is a disputed point. According to C. Fedeli (Atti Soc. Tosc. sc. nat. proc. verb. p. xxvii, pp. 8–20, 1918) the Pisa garden was founded in 1544, one year before Padua, but Roberto De Visiani, director of the Padua garden from 1836 to 1878, and his successor Pier Andrea Saccardo, insist on a later date (subsequent to 1545). Mattiolus, in the Preface to the 1559 Italian edition of his *Commentaries on Dioscorides* (*I Discorsi ne i sei Libri di Pedacio Dioscoride Anazarbeo della Materia Medicinale*), wrote as follows:

"The most illustrious and most serene Venetian Senate, through the persuasion of the most excellent college of physicians of Padua and other most noble and divine doctors, a few years previously conceived and constructed in the most beautiful city of Padua a sumptuous garden (*giardino*) for the use of the public and the embellishment of medicine. . . . Moved by that, the most excellent Cosmo, Duke of Florence, at the special behest of the noted physician, Luca Ghini, has caused to be constructed another like garden in the very ancient city of Pisa where, due to the work of its founder, there are growing today many rare plants which hitherto had never been found in Italy—maintained for the convenience and public adornment of doctors, scholars, and any others who delight in those things."

From this passage of a contemporary Italian botanist,[1] writing before this had become a mooted question, it would seem to be

[1] Mattioli was born in Siena, March 23, 1500, and died at Trieste in 1577. The passage translated above is from page 2 of the Preface of an Italian edition (Venice, 1559), a copy of which is in the library of the Brooklyn Botanic Garden. The wording of this passage varies somewhat in the different editions.

fairly well established that the garden at Padua was inaugurated first and the one at Pisa shortly thereafter. As Professor Longo, the present director of the Pisa garden has said, since the date 1545 for the founding of the Padua garden is substantiated by official documents, and since, up to the present, no documents have been discovered substantiating 1544 as the date of foundation of the Pisa garden, it may be necessary to continue " the noble contest for priority between the two cities without a definite conclusion, with the certainty, however, that it is the glory of Italy to have instituted the first university botanic garden." [2]

We may add that a due portion of this glory should be recognized as belonging to Luca Ghini (b. 1500; d. 1556) who, as noted above, was also instrumental in bringing about the establishment of the Padua garden as well as the botanic garden in Florence in 1550. He became the first director of the Pisa garden in 1547, being succeeded by his pupil, Andrea Cesalpino from 1554 to 1558. Cesalpino and Aldrovandi, the first director of the Bologna garden, were the first (or perhaps the first after their teacher Ghini) to form a herbarium. Cesalpino's book *De Plantis* (Florence, 1583) is credited with having inaugurated the era of modern botany, while his instructor, Ghini, was one of the greatest teachers of botany of all time, pupils flocking to him from all over Europe. Surely to have had these two men as directors is glory enough to make any botanic garden fairly indifferent as to whether it was the first or the second to be established. The names of Ghini and his famous pupil, Cesalpino, are on the Laboratory building of the Brooklyn Botanic Garden.

Among items of interest seen at Pisa may be mentioned the large wax models of the flowers of the "*Zucca*" or Gourd (*Cucurbita Pepo*), and longitudinal and cross sections of the ovary showing the germination of the pollen-grains on the stigma, and the growth of the pollen-tubes through the tissues of the style. This model was made by Calamai under the direction of the now famous botanist, Amici (1786–1863), for the latter to use at the First Convention of Italian Scientists, held at Pisa in 1839. At this meeting Amici not only demonstrated the germination of pollen and the course of

[2] Longo, Biagio. Le Piante pice notevoli del R. Orto Botanico di Pisa. Pisa, 1922.

FIG. 18. Wax Model showing flowers of the "Zucca" or gourd (*Cucurbita Pepo*), and details of structure of the ovary showing the entrance of the pollen tube into the embryo-sac, as discovered by Prof. B. G. Amici in 1830. Modeled under his direction. (6972.)

the tube down through the tissues of the style to *and into* the embryo-sac through the micropyle, but also evidence that the pollen-tube delivered the fertilizing or fecundating matter to the primordium of the embryo (now called egg-cell or egg), already existing in the embryo-sac, fertilizing it, and thus initiating the development of the embryo. Prior to Amici's investigations the German botanist, Schleiden, and others had held that the embryo arises in the end of the pollen-tube and is merely carried by it to the embryo-sac for further development. This wax model, in colors, is of very perfect execution, showing the histological details with great clearness. It is, of course, of the greatest historical interest and importance. Without this discovery of Amici the whole modern sciences of genetics and eugenics would have been impossible. The model bears the following inscription:

*"Preparazioni in cera demonstranti la fecundazione nella piante scoperta da Giovanni Battista Amici e da lui esibite nella adunanza del 7 Octobre 1839 in occasione della prima Reunione degli Scienziati Italiani tenuta in Piza. Opera dell' artifici Luigi Calamai."*

Among the plants of interest were a Maidenhair Tree (*Ginkgo biloba*), 5 ft. in diameter, but now moribund; a Cedar of Lebanon (*Cedrus libani*), 5 ft. in diameter; a lovely clump of big Bamboo (*Phyllostachys bambusoides*); and a *Magnolia grandiflora,* 30 inches in diameter. Grape vines were grown for the purpose of securing shade for other plants. The garden has, besides its scientific staff (a director and two assistants), one head gardener and 5 gardeners. About 125 students of agriculture, medicine, and pharmacy study each year at the garden. We were greatly indebted to Dr. Ugolino Martelli, Professor in the University of Pisa and one of the assistants at the garden, who acted as guide and made our visit most pleasant and profitable.

## Genoa

The Genoa garden (Orto Botanico della R. Università di Genova), was established in 1803, a small garden along the north side of the Palazzo Universatario, under the directorship of Domencio Viviani until 1839. It was here that Frederico Delpino, the third director (1872–1884), carried on his well-known and valuable studies on the cross-pollination of flowers. Here also Ottone

Penzig (fifth director, 1886–1929; deceased March 6, 1929), did the work embodied in his two volumes on *Pflanzenteratologie*. The original small garden was enlarged from time to time by the addition of adjacent land, and in 1890 Thomas Hanbury (see under La Mortola, below), friend and admirer of Penzig, provided the University of Genoa with funds for the erection of a building to house the school, laboratories, museum, and other collections of the Instituto Botanico. In accordance with the only condition attached to the gift, the institute is known as the Instituto Botanico Hanbury. The building was dedicated in 1892 during the meeting in Genoa of an International Botanical Congress. The botanical museum, like the garden, is open at specified times to the public. The present director of the garden is Prof. Augusto Béguenot (1929– ).

## La Mortola

A railroad journey of about four hours west from Genoa brings one to Ventimiglia, near the Franco-Italian frontier. A short automobile ride west of Ventimiglia brings one to La Mortola, the beautiful private garden developed by Thomas Hanbury, Esq. (later Sir Thomas Hanbury, K.C.V.O.), an Englishman, the benefactor of the Genoa botanic garden, and known the world over as a patron of horticulture and botany. The entrance gate is 338 ft. above the sea, and the gardens slope from that point down to the Palazzo Orengo, nearly 200 ft. below, and from there down to the ocean, which is in full view from various vantage points. The property was taken over by Hanbury in 1867. The garden has an area of about 59 acres, and has been developed in a strictly naturalistic treatment into a place of rare beauty and horticultural interest. It is not, strictly speaking, a botanic garden, but experiments have been carried on here for many years for the purpose of trying out the hardiness of plants from all over the world in such a dry climate, with soil only moderately fertile.

A portion of an old Roman road, the *Via Aurelia,* built in the year 13 B.C. to connect Albingaunum (Albenga) with Nicaea (Nice) extends through the garden, and has been carefully preserved. A stone tablet states that along this ancient road passed Pope Innocent IV, 7 May 1251; Catherine of Sienna, June 1376; Nicolo Machiavelli, May 1511; Charles V, Emperor, November

1536; Pope Paul III, 1538; and Napoleon Bonapart, 3 April, 1796. Engraved on stone in the garden is this quotation from the Martial, Book IV, Ep. 29:

*Rara juvant: primis sic major gratia pomis, hibernae pretium sic meruere rosae.* (Rare things delight: thus the earliest fruits give most pleasure, and winter roses bring the highest price.)

It would require a book of many pages to describe the features in this garden of interest to the student and lover of plants—the wonderful cypresses and other evergreens, the enormous specimens of *Aloe* and century plants (*Agave*), deciduous trees of many kinds, ferns and flowering plants, grapes and fruit trees, vines and rock garden plants, Euphorbias and oranges—all arranged so as to make a garden of supreme beauty, as interesting to the landscape architect as the individual plants are to the horticulturist and botanist. There were broad masses of Iris, planted along walks that extended between two rows of trees.

Though not a botanic garden, as that term is now understood, La Mortola has a botanical library of some 1500 volumes and 600 pamphlets; a herbarium of about 30,000 specimens, and a museum. The garden publishes a seed list, and has distributed without charge as many as 12,000 packets of seeds in one year. It was established in 1867 and the present owner is Commendatore Cecil Hanbury, K.C.V.O., F.L.S., F.R.H.S. The library of the Brooklyn Botanic Garden has a copy of the *Proposed Congratulatory Address to Sir Thomas Hanbury* which was presented to Sir Joseph Hooker by Lady Hanbury. This address, beautifully engrossed, was to have been presented to Sir Thomas on his 75th birthday, June 21, 1907, but his death occurred on the 9th of March preceding.

I cannot close this account of visits to the gardens of Italy without grateful acknowledgment of the cordial reception and uniform courtesy everywhere extended. On account of its being vacation time for the colleges most of the garden directors were absent for field work, conventions, or vacation, but everything possible was done by those in temporary charge to make the visits pleasant and profitable. Many delightful and advantageous contacts were established, publications and information obtained, and arrangements made for the exchange of publications, seeds, and other material.

## French Gardens

### Grenoble

From Ventimiglia we proceeded by train to Nice and thence, *via La route des Alpes,* by auto-bus to Grenoble. The Jardin des Plantes here is affiliated with the botanical institute of the University of Grenoble. The herbaceous garden is arranged on the Systematic basis. Small rectangular concrete tanks built into the herbaceous beds provide for aquatic plants in the same bed as their "dry" land relatives. Clumps of rock are also placed in the herbaceous beds to provide for saxatile species in their systematic sequence. The systematic beds have borders of labelled horticultural varieties that may or may not be related botanically to the species in the beds. This adds much to the appearance of the garden. About half of the garden, containing trees and shrubs, serves also as a public park, and is apparently much used as such by the public. The garden was established in 1899; it has an altitude of 2075 meters, and an area of about ten acres. It is divided into the following sections:

1. A large area, scattered with rocks, simulating a small valley, traversed by a rivulet which empties into a small pond. This section is devoted specially to the flora of Lauteret, the classic Alpine ground of botanists. 2. A large area, comprising the systematic collection, is devoted to the flora of the western Alps in general. 3. All the rest of the garden is divided into eight regions, each built up of a collection of rocks, and devoted, respectively, to the following botanical regions: *a*. Jura (calcareous rocks); *b*. Pyrinees; *c*. Mountains of the Mediterranean region; *d*. Caucasus and Ural; *e*. Eastern Alps and Carpathians; *f*. Himalaya, Tibet, Altai, Siberia; *g*. Arctic regions; *h*. Miscellaneous mountain regions.

The University of Grenoble maintains two other Alpine gardens —Chaumusse (altitude 1850 meters), established 1892; and Villard-d'Arenes (1675 meters), established 1899.

### Paris

From Grenoble we proceeded to Paris and re-visited the Jardin des Plantes which we first visited in 1927. It is not essential fully to describe here this famous garden, which has been so often de-

scribed, except to note that its plantations are arranged on the systematic basis, nearly the entire area being given up to beds and walks, with no lawn. The garden, of about 58 acres, founded in 1626, as the Jardin Royal or Jardin du Roi, is of great historical interest. The famous Lamarck held a botanical appointment here from 1788 until 1793 when the Convention of June reorganized it, changed the name to Muséum National d'Histoire Naturelle, and shortly thereafter established a zoological park. The famous seventeenth century botanist, J. P. de Tournefort (1656–1708) was professor in the Jardin du Roi under Louis XIV. It may be recalled that his *Institutiones rei herbariæ* (1700), was the first book in which characters were assigned to genera, and was the standard authority until Linnaeus. Tournefort was succeeded in 1708 by Antoine de Jussieu. The herbarium contains the collections of the Jussieus—Antoine Laurent (nephew of Antoine) and his son Adrien, and of Auguste de St. Hillaire. The systematic section of the garden is arranged after the Jussieu system of classification.

The Porte d'Austerlitz, the main entrance, opens to the Esplanade Lamarck, on which there is a statue of Lamarck erected in 1908 with funds provided by universal subscription. On the front of the pedestal is the inscription, *Au Fondateur de la Doctrine de l'Evolution,* and under the bas relief the following: *La postérité vous admirera; Elle vous vegnera, mon père.*

Among plants of special interest in the Paris garden is a large Cedar of Lebanon, with a label stating that it is one of the two first trees brought from England by Bernard de Jussieu (brother of Antoine and uncle of Antoine Laurent) in 1734, and therefore now nearly 200 years old. These trees are said to have been given to Jussieu by the English botanist, Collinson.

A visit was made to the gardens at Fontainebleau, and the Bagatelle rose garden was revisited, but not the *Roseraie de l'Hay les Roses,* which I saw in 1927.

## Père Lachaise Cemetery

The famous Paris cemetery of Père Lachaise is of considerable botanical interest for it contains the graves of numerous French scientists, including the zoologist, Jeffroy St. Hillare (protagonist for the doctrine of evolution against the non-evolutionist, Cuvier,

just one hundred years ago this year), and Parmentier, who introduced the potato into France, and succeeded in getting it generally accepted as a food-plant. His name is perpetuated in *parmentière*, the synonym for *pomme-de-terre*. His modest monument in the Père Lachaise cemetery bears the following inscriptions:

On the north side: "*Monument élevé à la mémoire d'Antoine Augustin Parmentier par les pharmaciens civils et militaires de France, ses Eleves, ses Amis, ses Collegues.*"

On the east side: Bas-relief of a grapevine (left), a still (center), and a basket of potatoes (right). On the day of our visit (or shortly before) some admirer had laid a large potato on this face of the tombstone.

On the south side: "*Ici repose Antoine Augustin Parmentier—Pharmacien—Membre de l'Institut de France—du Conseil General des Hospices Civils de Paris—L'un des Inspecteurs Generaux du Service de Sante des Armes—Officier de la Legion d'Honneur—Né à Montdidier en 1737—Mort à Paris en 1813.*"

On the west side: In bas-relief a wheat plant (left), a plow with large wheels (center), a plant of Indian corn (right). At the top a bust of Parmentier in bas-relief.

These emblems all signify the various ways in which Parmentier introduced improvements in agriculture and in the dietary of the French army and nation. There is in the Brooklyn Botanic Garden a bronze tablet in memory of another member of the Parmentier family, who established the second commercial nursery on Long Island and the first institution in Brooklyn to be called a botanic garden.

## Ninth International Horticultural Congress

From August 7th to 15th I attended the Ninth Annual International Horticultural Congress in London, as delegate from the Brooklyn Botanic Garden, the New York Horticultural Society, the American Scenic and Historic Preservation Society, and the National Institute of Social Sciences. There was a large and representative attendance, and the meetings were held in the Society's own buildings, admirably adapted for such a purpose and also for public horticultural exhibits. One could not help contrasting the flourishing condition of organized horticulture in

England—the Royal Horticultural Society, with its more than 27,000 members, as of Nov. 12, 1929, 2437 elected in 1929, its ample buildings, its endowment of over £38,900, assets of over £256,000, and its annual budget for 1929 of over £53,000—with the condition at home, where, for example, the New York Horticultural Society has only 2200 members, annual budget of $126,000 (1929), an endowment fund of $20,000 (1929), and has available only rented quarters for its offices, meetings, lectures, and exhibits. This contrast is due, in part, to the fact that the Royal Horticultural Society was established 126 years ago (1804), in a country whose civilization was old before America was discovered, and is the only horticultural society in Great Britain; whereas the New York Horticultural Society was established only twenty-eight years ago (in 1902), in a country of new civilization, where there are also several other similar organizations in adjacent states. But, notwithstanding, America makes a poorer showing than England in proportion to total and per capita wealth and total population. Fortunately, the situation is steadily improving in America, where interest in ornamental gardening and all aspects of horticulture is constantly increasing.

The Congress was held by the invitation of the Royal Horticultural Society and under the auspices of the International Committee for Horticultural Congresses, with H. R. H. The Duke of Connaught and Strathearn, K.G., as patron. The president of the Horticultural Society is Mr. G. W. E. Lowder, F.L.S., and the success of the Congress was due in large measure to the efficient work of the secretary of the Society, Mr. F. R. Durham, C.B.E., M.C., and his able assistant secretary, Mr. A. Simmonds, N.D.H. The honorary secretary was Dr. M. J. Sirks, of Wageningen, Holland.

The scientific programs on August 8–13, were devoted largely to practical matters, and were grouped under the three general headings of Propagation, Pomology, and Tropical and Sub-Tropical Horticulture. It was interesting to note that many (perhaps a majority) of the papers might with equal propriety have been given on the program of a botanical convention. The centrifugal tendency among the plant sciences during the past twenty-five years has, in the opinion of the writer, been unfortunate and inimicable

to the best interests of all concerned. The essential unity of interest and problems was emphasized by the nature of the papers on this program, and we hope the future may bring about a closer rapport in organization, nomenclature, and otherwise among all the various aspects of pure and applied botany and its various organized groups.

A lecture on "The Educational Work of the Brooklyn Botanic Garden," given on the afternoon of August 13th by the Director, was very well attended, and was followed by considerable discussion. Among the various excursions planned for the Congress the Director attended those to the Royal Horticultural Society's beautiful gardens at Wisley; Messrs. James Carter & Co.'s Trial Grounds, Raynes Park; the Royal Botanic Gardens, Kew; and the Hampton Court Gardens, all of which yielded many ideas and ideals and much inspiration to be applied in the further development of our own Garden.

There were of course the usual receptions and teas, including a reception by H. M. Government at Lancaster House on the evening of the eighth, and a complimentary dinner given by the Royal Horticultural Society to the official delegates in Greycoat Street Hall on the eleventh. The meetings closed with a Flower Show in Greycoat Street Hall (the exhibition hall of the Society) from 9 a.m. to 5 p.m. on the fifteenth. This was a remarkably beautiful exhibit.

### *Horticultural Nomenclature*

The following resolution of the committee on nomenclature is of special interest:

"A list of names valid at the time it is made should be drawn up and should be good for, say, six years. It is imperative that this list should follow strictly the rules of botanical nomenclature so far as species and botanical varieties are concerned, and that the names of plants generally accepted as conformable to the rules at the time of the making of the list should alone be used. All personal preferences and individual usage must be sunk if not in conformity with these rules. This list should be used universally in catalogues, horticultural literature, and gardens for a fixed period. An international committee should be appointed to revise this list in the light of botanical research at intervals of six years. Such

alterations as are admitted at these revisions should be shown therafter in catalogues for the next period with the superseded name as synonym."

Further resolutions provided as follows: Names of horticultural varieties should, as far as possible, consist of a single word, and at most only three words are permitted. Varietal names in use for a variety of one kind or genus of plant should not be used again for another variety of the same genus even in connection with another species. The varietal name should follow the specific name with or without the abbreviation "var." preceding it.

The varietal name should not be in Latin unless it designates some character of the plant (e.g., *nanus, albus*), or its place of origin (*kewensis*). Latinized proper names for varieties is not permitted. Thus, *Victoria regia* Tricker is the approved form, not *Victoria regia Trickeri; Dianthus deltoides* var. Brilliant (not *brilliantissimus*).

The prefixes Mr., Mrs., Miss, and their equivalents should be avoided, and also the articles "A" and "The," except in languages where they form an integral part of the substantives (e.g., "Giant," not "The Giant"; but *Pelargonium peltatum* La France). Existing names need not be altered to conform to the new rules, but they apply to all new names proposed.

During the week of the Congress the rooms of the Linnean Society, Burlington House, Picadilly, were open as the London Reception Room of the Botanical Congress. These rooms, and also those of the Royal Society, also in Burlington House, were open for inspection by Congress members from 10 a.m. to 4 p.m. on August 14th and 15th. Among the priceless treasures exhibited by the Linnean Society was the original M.S. of Linnaeus's *Species Plantarum*.

## Fifth International Botanical Congress

On August 16–23 I attended the Fifth International Botanical Congress at Cambridge, under the presidency of Prof. A. C. Seward, Master of Downing College, and head of the Botany School at Cambridge. Sessions for the reading and discussion of scientific papers were held every morning and afternoon in the various rooms of the botany school. A reception was held on the evening of the 16th in St. John's College by the kind invitation of the Mas-

ter and Fellows, and an organ recital was given on Sunday evening, the 17th, in the beautiful chapel of King's College. The evenings were devoted to popular lectures, and honorary degrees were conferred by the Vice-Chancellor of the University in the Senate House on the afternoon of August 20. A garden party was held at Downing College on the afternoon of the 20th by the kind invitation of the Master and Mrs. Seward, tea being served in the gardens. Delegates were presented to the President of the Congress at a plenary meeting at 6:15 p.m., on August 20. The final plenary meeting was held at noon on the 23d.

### *Botanical Nomenclature*

Perhaps the most important work accomplished at this congress was the revision of the rules of botanical nomenclature. Hitherto different systems of nomenclature have been followed in different countries—the so-called "American Code" by some (though not all) botanists in the United States, and the "Vienna Code," adopted at the Vienna Congress in 1905 in other countries. The result has been unsatisfactory, and a hindrance to the advancement of systematic botany. At the Congress of Botanists held in Ithaca, N. Y., in 1925, the Cambridge Congress was charged with a revision of the Rules of Nomenclature for the scientific names of plants. At all the sessions of this Section, presided over by Dr. E. D. Merrill, Director-in-Chief of the New York Botanical Garden, as chairman, there was manifest the closest international harmony, and the result was the unanimous adoption of an International Code of Nomenclature that will undoubtedly be followed henceforth by the majority of botanists of all countries. This was a great step forward.

### *Hooker Memorial Tablet*

Notice of this meeting should not be concluded without mention of the Unveiling and Dedication of a Memorial Tablet to Sir William Hooker and his son, Sir Joseph Dalton Hooker, in St. Mary's Church, Halesworth, on Sunday, August 17, at 2:30 p.m. Some of the masonry of this old church dates back to the year 972 A.D. The tablet, of Hopton Wood Marble (Darbyshire), was designed by Mr. A. H. Gerard, assistant to the professor of sculpture of

the Slade School of University College, London, and was cast by Wedgewood. It is of incised relief, similar to that used by the Egyptians 3000 years ago. As explained to the writer by Mr. Gerard, the design on the lower border represents flowers that trail on the ground, the side border upright growing plants. The top border has in the center a conventional sun, the source of energy for plant life, and five conventionalized birds signifying seed dispersal. The plants on the side are a species of heather magnified 40 times. The inscription reads as follows:

"This tablet records the association with Halesworth of Sir William Hooker and of his son, Sir Joseph Hooker, who in succession became the directors of the Royal Botanic Gardens, Kew. Sir William Hooker lived in Halesworth from 1809 to 1820, and here Sir Joseph was born in 1817. Erected 1930."

The tablet was unveiled by Sir David Prain, formerly director of the Royal Botanic Gardens, Kew, and the dedication was by the Bishop of St. Edmundsbury and Ipswich (Halesworth is near Bury St. Edmunds). The scriptures were read by Lord Ullswater, former speaker of the House of Commons, who read from Ecclesiasticus xvii, 1–11 and li, 23–30. The text for the address was Psalms civ, 24. "O Lord, how manifold are thy works! In wisdom thou hast made them all; the earth is full of thy riches." The speaker made a plea for a greater mutual toleration between science and theology, and for more serious attempts by both scientists and theologians to understand sympathetically each other's aims, ideals, and methods. Among those present at the exercises at the church, and at the old homestead were two sons and several grandchildren of Sir Joseph Hooker.

While at Cambridge I revisited the interesting and well-kept Cambridge Botanic Garden, which is in charge of Mr. Humphrey-Gilbert Carter, Curator. The garden, of 21 acres, belongs to the University of Cambridge and is governed for the University by the Botanic Garden Syndicate. There is here a small but excellent rock garden. The Botanic Garden supplies the material for instruction to the botany school of the University.

On Sunday, August 24, members of the Congress visited what is, perhaps, the greatest shrine in the world of biological science—Down House, Charles Darwin's residence at Down, Kent. The points of greatest interest were the famous sand walk, where Dar-

FIG. 19. Darwin's study at Down House. This is the room in which the *Origin of Species* was written. (6973.)

win took most of his exercise and did much of his thinking, and the old study in which the *Origin of Species* was written. The house and grounds were presented to the British Association for the Advancement of Science by Mr. George Buckston Browne, during its meeting in Leeds, in 1927. Many articles of association with Darwin have been assembled here and are being added to from time to time by gift.

In may be incidentally mentioned in this connection that while in Cambridge I secured for our library an autographed letter of Darwin, as well as other autographs and several unusual portraits of botanists.

After the conclusion of the Congress in Cambridge, the delegates were entertained at Kew, and also at the Natural History Museum, South Kensington. The botanical treasures exhibited at the Museum included the herbarium of Sir Hans Sloane, specimens of the herbarium of Linnaeus, a collection of 3000 specimens forming the types of Linnaeus's *Hortus Cliffortianus;* the European herbarium of John Ray (1627–1705) ; American plants collected by John Bartram (1699–1777), founder of the first botanic garden in America; collections of William Bartram (1739–1823), including the only known specimen of *Franklinia altamaha* Bartram (*Gordonia pubescens* L'Héritier) ever found growing wild. The tree is now apparently extinct in the locality where Bartram found it. (Several specimens are growing in the Brooklyn Botanic Garden.) Also, the herbarium of Philip Miller (1691–1771), curator of the Chelsea Physic Garden; manuscripts of Robert Brown (1773–1858) ; drawings by Schleiden (1804–1881), founder (with the zoologist Schwann) of the cell-theory; a collection of microscopic slides of the mycologist, de Bary (1831–1888) ; Peter Collinson's account of the first introduction of American seeds into Great Britain, and the " microscope " used by Robert Brown and (possibly) by the use of which he discovered the nucleus in cells.

Plants from the Chelsea Physic Garden were also exhibited. In 1712 Sir Hans Sloane bought the Manor of Chelsea and with it the Physic Garden, founded by the Apothecaries' Company in 1672. He turned the property over to the Apothecaries in 1722 for an annual payment of five pounds, and on the further condition that the Apothecaries should, every year for forty years, deposit with

the Royal Society (of which Sloane was one of the founders), fifty herbarium specimens, mounted and named, all of plants grown in the Chelsea Garden, and no two alike. The Royal Society presented these plants to the British Museum in 1781.

The British Museum herbarium is in charge of Mr. J. Ramsbottom, who has recently succeeded Dr. A. B. Rendle. Dr. Rendle was honorary treasurer of the Horticultural Congress.

Returning, I reached New York on September 16.

Respectfully submitted,

C. Stuart Gager,
*Director*

# REPORT ON A TRIP TO ENGLAND AND NORTHERN EUROPE

DR. C. STUART GAGER, DIRECTOR:

I take pleasure in submitting a report of my travels to England, Scandinavia, Russia, and Germany during August, September, and October, 1930. I went to attend the International Botanical Congress in Cambridge, being particularly interested in the nomenclature discussions and in the possibility of greater unity among the various botanic gardens as to families and genera. I also planned to visit my native country, Norway, and from there to go to Russia chiefly to learn something about botanical publications relating to that extensive part of the temperate regions and of the possibility of exchanges.

I went on board the S. S. *Bremen* at Brooklyn Friday evening, August 1st. I was fortunate in having as stateroom companion Professor J. N. Couch, of the botany department of the University of North Carolina. It was the fastest trip I had ever made across the Atlantic, for by Wednesday evening we saw the lighthouses off the English coast, and Thursday forenoon called at Cherbourg, France. At noon we left the *Bremen* near Southampton.

In London I attended some of the meetings of the International Horticultural Congress and of its Committee on Nomenclature; also an interesting excursion to the John Innes Horticultural Institution. It was decided to prepare an International List of Horticultural Species, in Latin only. Holland, Germany, and the United States now have horticultural name lists, but these do not correspond with one another nor with the usage in other countries. The new list is being prepared by Dr. Camillo Schneider and Dr. Robert Zander, of Berlin, with the aid of specialists. It will be submitted first to the Committee of about twenty members representing ten nations, with Dr. Rendle, of the British Museum herbarium, as chairman, and afterwards to the Paris Horticultural Congress in 1932. This is the first attempt to seek international sanction for a list of horticultural species. As the horticulturists have expressed their intention to follow the botanical rules of nomenclature, it may

be expected that the new list will be widely accepted also by botanic gardens, although such a list cannot be expected to include the very great number of species cultivated by botanic gardens.

Registration for the Cambridge Congress was at the Linnaean Society, in London, where an exhibit of botanico-historical interest was arranged. A special train took the botanists to Cambridge, two hours distant, August 16th. The Congress continued one week. Dr. Diels, director of the Berlin Botanic Garden, was chairman of the Taxonomic Section, and Dr. Merrill, director of the New York Botanical Garden, presided over the nomenclature discussions. At first it appeared as if the work could not be completed, but progress was speeded by a decision to consider only those points as to which there were decided differences of opinion in the International Committee.

Three points especially caused prolonged discussion, namely, Latin diagnoses, *nomina specifica conservanda,* and the question of homonyms. The American view of homonyms was carried, though opposed by many European and by some American botanists. Latin diagnoses were carried by a large majority, but it was decided to extend the enforcement of the rule till January 1, 1932.

At the final meeting the question of family names was reconsidered, on motion of Dr. Barnhart. Dr. Pennell's proposal that family names should be formed from genera, with the names *Cruciferae, Compositae* also permitted, was carried. The similar proposal of British botanists, to have all orders terminate in *-ales*, was not carried. On motion of Mr. Ramsbottom, Keeper of the Herbarium, British Museum, a provision was made that new points were to be considered as tentative for five years and could then be reconsidered. A large General Committee on Nomenclature was formed, with American members Barnhart, Fernald, Hitchcock, Jepson, Maxon, Merrill, Rehder. The general executive committee of seven were Barnhart, Harms, Janchen, Maire, Ramsbottom, Rehder, Sprague; that is, four from England and America, three from the rest of the world. Special committees were to consider *nomina conservanda* and other matters; that for the phanerogams and ferns consisting of seven, namely, Christensen, Fernald, Harms, Maire, Maxon, Rehder, Wilmott. The resulting

compromise on nomenclature will result in considerable modifications of names in both the American and International systems.

I attended some of the meetings of the paleobotanists, and was especially interested in hearing that there seemed to be agreement that the *Rhynia* group represents the earliest land plants and that this group was followed by three main lines represented by club-mosses, horsetails, and ferns.

Returning to London, groups of botanists inspected Kew gardens under guidance. The spacious grounds with so many large trees are impressive. The group I accompanied was led by Mr. Summerhayes, who has recently published a monograph of Australian *Frankeniaceae*. It was evident that many plants were hardy in the climate of Kew which cannot grow in Brooklyn. Among these the Chilean shrub, *Eucryphia pinnatifolia*, with its abundant flowers, was conspicuous. At the herbarium Dr. Stapf called my attention to the collection of illustrations. Duplicate copies of illustrations of numerous works have been cut out and classified, so that the various illustrations of the same plant are all together.

Another interesting excursion was to Darwin's home at Down, Kent. It was about an hour's ride from London. It is now national property, in charge of the British Association for the Advancement of Science. We were met at Down by the anthropologist, Sir Arthur Keith. Of special interest was the sand walk, about half a mile long, acquired by Darwin a few years before his death, and where he took daily walks.

On August 30th I went to Hull and then by the Ellerman-Wilson Line across the North Sea. We arrived at Christiansand, near the south point of Norway, about midnight Sunday. The next morning there was bright sunshine but it was decidedly cooler than the last week in England. The morning stage had left early, so I arranged for my baggage and started on foot. I walked about ten miles through picturesque and constantly varying scenery; the road wound by rocky hills with forests chiefly of spruce, pine, and birch. There were lakes, and small farms with gardens and fruit trees, with occasional views of the fjord, at the end of which I was overtaken by the afternoon stage. When darkness came on I stopped in a small town and the next day continued to my native town of Kragerö. Here I remained a week on a near-by island. It was early fall, but everything was still green, with many flowers

in bloom, and much fruit and vegetables. Visiting the botany class in school I enjoyed seeing the pupils examine the fall flowers, but otherwise there was a great deal of book study. In an English class the pupils could read well, but were unable to speak English.

By train to Oslo, through the valley and mountain district of Telemark, I passed Gaustafjell, the highest mountain in southern Norway. At the botanic garden in Oslo I saw again Professor Holmboe, who had also just returned from England. He expressed his satisfaction that unity had been attained in the rules of nomenclature. The Oslo herbarium is of considerable size and rich in Scandinavian and Arctic specimens. The lichen collection in charge of Dr. Lynge is especially extensive. He had recently returned from an expedition to Northeastern Greenland. In earlier years he had collected in Spitzbergen and in Nova Zembla. He introduced me to Professor Broch, professor of Slavonic languages, who had just returned from Russia. Thus I obtained helpful information and letters of introduction to Mr. Platou, Norwegian Consul in Leningrad, and Dr. Wolgin, secretary of the Leningrad Academy of Science. At the Russian Legation I was informed that there would be no delay in obtaining the visa to enter Russia. I must bring three photographs, write out the required information and pay $12.

In Oslo I visited the school gardens, which are very extensive, perhaps fifty acres in different places. The children do not have individual plots. They had begun that way, I was told, but it did not work so well as the present method. Groups of about thirty children each worked under the direction of a teacher. The aim was not primarily educational, as with our Children's Garden, but to produce as much vegetables and fruit as possible. Piles of fruits and vegetables were laid by the garden paths, one for each child working, and taken by them in bags or baskets as they went out. Often the parents stood at the gates with baskets to help carry, as the loads in the fall were so heavy. The children were especially concerned as to how many apples or pears they were going to have; the vegetables aroused less interest. Near-by, and also in different parts outside the city, were "kolonihaver" or allotment gardens. Here plots of about half an acre are rented by the municipality for a very low sum and families put up small cabins and live there during the summer months.

Going to Trysil, 150 miles northeast of Oslo, there was another drop in temperature. Endless forests, chiefly of spruce, characterize this region; the birch trees were yellow, standing out brightly among the evergreens. Many people were busy making ditches, an operation required by the state whenever forest lands change ownership.

I stopped over night in the Swedish border village of Charlottenberg, so as to travel across Sweden by day. Here the comparatively level landscapes, with more numerous farms and villages, form a contrast with mountainous Norway.

Stockholm is beautifully situated on waters of the Mälaren, branching bays of the Baltic. The botanic garden, formerly called Bergiansk Trädgård, now Bergielund, is a short distance to the north. It is about half the size of the Brooklyn Garden, with a picturesque situation by a lake. Dr. Fries, whom I had met in England, took me about the garden. Most conspicuous among the flowering plants at this time was the yellow climber, *Tropaeolum peregrinum*. There were many American goldenrods, but they had an unfamiliar appearance and it was difficult to recognize the species. Whether the difference in appearance is due chiefly to the different climate or in part to the greater length of day in this northern latitude, I do not know. The rock garden consists of three large piles of granite rocks, representing America, Scandinavia, the Alps and Asia.

The Natural History Museum of Zoology and Geology is a large building not far away; by it is the separate botany building, including a large herbarium and museum in charge of Dr. Samuelson. Dr. Asplund took me about the herbarium, especially rich in South American material. I was particularly interested in seeing the original specimens of *Frankenia Clarenii* Fries.

Some distance north of the botanic garden, at Berghamra, are about a hundred "colony-gardens" with small summer houses similar to those I saw near Oslo. Here the land is rented by a special society.

A night steamer took me over the Baltic to Åbo or Turku, Finland, passing the Åland Islands and innumerable small forest-covered islands nearer the Finnish mainland. I then took a train across the country to Helsingfors. It is nearly level, with extensive grasslands and forests. Ditches, twenty or thirty feet

apart, run everywhere through the farming regions. In Helsingfors I found no difficulty in getting along with a few Swedish words, but in eastern Finland the people did not usually understand any language that I knew anything about. I stopped over night in the little village of Rajajoki only a mile from the Russian line, and here I found it necessary to get along as best I could with sign language.

In the morning the train soon crossed the little river separating Finland from Russia. There is a bridge, painted half red and half white, with soldiers on each side. The train stopped and baggage had to be taken to the customs house to be closely examined. After papers were looked over it was necessary to give information as to the exact amount of cash carried. An hour's further travel and the train stopped in the Finland station in Leningrad.

Crossing the Neva on a crowded street car, I recognized from pictures the Peter and Paul fortress and the Winter Palace. I had some misgivings whether I would get off at the right place, but I did reach the Hotel d'Europe, and here there were no more language difficulties.

Leningrad appeared like a very large city. The Neva divides to form two large island suburbs, Wassilevsky, with the university and museums, and Petrogradskaja, near which the botanic garden is situated. The main street, the Nevsky Prospect, is south of the Neva; it is generally called by the old name though the official name is now Street of the 25th October.

I was in Russia ten days, in Leningrad only, from September 30th to October 10th. The temperature was two or three degrees above freezing, except one day when a couple of inches of snow fell. It appeared like winter, but the snow was gone the next day. The leaves of trees had nearly all fallen, except that the poplars along the many canals were still green.

At the botanic garden I was cordially received by Dr. Roskevitz, and later met Dr. Komarov, director; Dr. Iljensky, in charge of living plants; Miss Hammerman, at the botanical museum; Dr. Fedchenko, in charge of the herbarium; Mme. Stroukow, his secretary; and Mr. Ohl, librarian. To all of them and others my thanks are due for making my visit to Russia very interesting and instructive.

The Leningrad botanic garden contains about 30 acres. The conservatory collections are very extensive. I mention only two small but thriving specimens of *Welwitschia mirabilis*. They were in double pots, the outer only watered. They came from seeds from Stellenbosch Botanic Garden, South Africa. On my return to Brooklyn I found we also had acquired this interesting plant during my absence.

The main building was completed just before the war. The very large herbarium is divided geographically into six divisions: European Russia, Caucasus, Siberia, Central Asia, Northern China, and one division for other parts of the world. The specimens are arranged under the Dalla Torre and Harms generic numbers. For example, *Frankenia* occurs under 5233 under these various divisions.

Mr. Ohl, librarian, kindly took out the most important systematic works of which I made a list, which was afterwards extended by Dr. Fedchenko. I was assured there would be no difficulty in making an approximate list of the genera of the higher plants within the Soviet Union.

The Institute of Applied Botany, in a central part of the city, was being remodeled. It has extensive collections of varieties of wheat and of economic plants in general. At the Zoological Museum I saw the famous Siberian mammoth. I also visited the Museum of Anthropology, the Hermitage Art Museum, and the Winter Palace, formerly the Czar's residence, now a Museum of the Revolution, with pictures of war and suffering.

From Leningrad I returned to Helsingfors and travelled by steamer for two days on the Baltic to Stettin, Germany, then by train to Berlin, where I also remained ten days. The first day in Berlin I saw a group marching with a red flag: " Für Sovjet gegen Young," nevertheless, Berlin looked much more prosperous than Leningrad.

Dr. Engler, world famous systematist, for nearly forty years director of the Berlin Botanic Garden, had died in his 87th year, just before my visit, and, like Theophrastus of old, was buried in his garden.

My stay in Berlin was favored with ideal fall weather, which encouraged walks in the botanic garden and the Grünewald forest not far away. Here poplar trees and also locusts were still green.

The garden includes about eighty acres. There are numerous geographical divisions: German forest, various European and other mountain regions, American forests, etc. There is also an extensive arboretum, an herbaceous division, and a division of economic plants.

In the herbarium I was chiefly occupied with the Frankenias. I was also interested in discussing, chiefly with Dr. Harms and Dr. Melchior, the subject of genera and nomenclature. I also spoke again with Dr. Gilg and Dr. Diels about the possibility of an English edition of Engler's *Syllabus der Pflanzenfamilien,* to include the decisions of the Cambridge Congress. I met Dr. Schneider and Dr. Zander, and learned from them more about the plans for the proposed International List of Horticultural Species.

While in Berlin I had occasion to visit the very interesting Planetarium, near the zoological gardens. Every day and evening there are groups from schools or societies, or sessions for the general public. Around Berlin, too, they have extensive "colony-gardens," and it appeared that the children who had lived there during the summer not only had learned about plants, but had also become interested in the starry heavens.

On October 25th I sailed on the S. S. *Columbus*, and on November 1st reached Brooklyn, just three months after my departure.

Respectfully submitted,

ALFRED GUNDERSEN,

*Curator of Plants.*

# DELECTUS SEMINUM, BROOKLYN, 1930

## List of Seeds Offered in Exchange

These seeds, collected during 1930, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. They are not offered for sale.

**N.B.** Applications for seeds must be received by us **not later than** February 28, 1931.

### Seeds of Trees and Shrubs

### GYMNOSPERMAE

**Cupressaceae**

Juniperus
communis var. depressa

**Pinaceae**

Pinus
rigida
Pseudotsuga
taxifolia
Tsuga
canadensis

### DICOTYLEDONES

**Aceraceae 163**

Acer
Negundo
Opalus
Pseudoplatanus
saccharum

**Anacardiaceae 153**

Rhus
copallina
glabra
Toxicodendron
Vernix

**Aquifoliaceae 157**

Ilex
crenata
glabra

**Araliaceae 227**

Aralia
spinosa

**Asclepiadaceae 248**

Periploca
graeca

**Berberidaceae 93**

Berberis
Regeliana
Thunbergii
vulgaris

**Betulaceae 61**

Alnus
glutinosa
incana

Betula
lenta
lutea
papyrifera
populifolia
Carpinus
caroliniana
Ostrya
virginiana

**Bignoniaceae 258**

Catalpa
bignonioides

**Caprifoliaceae 271**

Diervilla
florida
rivularis
sessilifolia
Lonicera
Maackii var. podocarpa
Sambucus
canadensis
var. submollis
racemosa
var. tenuifolia
Symphoricarpos
albus
occidentalis
occidentalis var. Heyeri
Viburnum
acerifolium
dentatum
hupehense
Lentago
Opulus
pubescens
var. affine
scabrellum
theiferum

**Celastraceae 158**

Celastrus
scandens
Euonymus
Bungeana
patens

**Clethraceae 230**

Clethra
alnifolia

**Compositae 280**

Iva
oraria

**Cornaceae 229**

Cornus
alba
Amomum
brachypoda
canadensis
florida
obliqua
paniculata
paucinervis

**Elaeagnaceae 215**

Elaeagnus
umbellata

**Ericaceae 233**

Erica
stricta
Kalmia
latifolia

**Ericaceae**

*—Vaccinioideae 233a*

Gaylussacia
baccata
Vaccinium
stamineum

**Fagaceae 62**

Quercus
alba
coccinea
ilicifolia
Prinus
stellata
velutina

**Guttiferae 187**

Hypericum
hirsutum
maculatum

**Hamamelidaceae 123**

Hamamelis
virginiana
Liquidambar
styraciflua

**Juglandaceae 60**

Carya
cordiformis
ovata

**Lauraceae 102**

Benzoin
aestivale

**Leguminosae**
*—Caesalpinoideae 127b*

Gleditschia
triacanthos

**Leguminosae**
*—Papilionatae 128*

Amorpha
fruticosa
microphylla
Campylotropis
macrocarpa
Caragana
arborescens
Colutea
arborescens
Cytisus
scoparius
Genista
sagittalis
tinctoria
Lespedeza
formosa
Robinia
Boyntonii
Pseudoacacia
Wisteria
sinensis

**Loganiaceae 245**

Buddleia
albiflora
Davidii
Davidii var. magnifica
Davidii var. Veitchiana
Davidii var. Wilsonii
nivea

**Moraceae 64**

Broussonetia
papyrifera
Maclura
pomifera

**Myricaceae 57**

Myrica
carolinensis

**Oleaceae 243**

Fraxinus
americana
excelsior
longicuspis
oregona
Ligustrum
Ibota
Ibota var. Regelianum
vulgare
var. atrovirens
Syringa
Josikaea

**Polygonaceae 77**

Polygonum
Aubertii

**Ranunculaceae 91**

Clematis
paniculata
virginiana
Vitalba

**Rhamnaceae 169**

Ceanothus
americanus
Rhamnus
cathartica
Frangula

**Rosaceae 126**

Physocarpus
opulifolius
Potentilla
fruticosa
Rhodotypos
kerrioides
Rosa
damascena
multiflora
multiflora cathayensis
virginiana
Wichuriana
Rubus
odoratus
Sorbaria
Aitchisonii
arborea var. glabrata
sorbifolia
stellipila
Spiraea
albiflora
Billiardii
Douglasii
latifolia
tomentosa

**Rosaceae**
*—Pomoideae 126a*

Aronia
arbutifolia
atropurpurea
melanocarpa
Chaenomeles
Maulei
Cotoneaster
Dielsiana
Franchetii
horizontalis
Zabelii
Crataegus
compta
Oxyacantha
persimilis
Phaenopyrum
pinnatifida
Malus
floribunda
ioensis
Zumi
Rhaphiolepis
umbellata
Prunus
maritima

**Rubiaceae 270**

Cephalanthus
occidentalis
Mitchella
repens

**Rutaceae 137**

Evodia
Daniellii
Phellodendron
japonicum
Poncirus
trifoliata
Ptelea
crenulata
trifoliata
Ruta
graveolens
Zanthoxylum
Bungei

**Salicaceae 56**

Salix
serissima

**Sapindaceae 165**

Koelreuteria
paniculata

**Saxifragaceae 117**

Deutzia
scabra
var. candidissima
Hydrangea
arborescens
paniculata
Itea
virginica
Philadelphus
coronarius fl. pl.
Lemoinei
Lewisii
Satsumi
pubescens

**Simarubaceae 138**

Ailanthus
glandulosa

**Solanaceae 256**

Lycium
barbarum
chinense
halimifolium

**Staphyleaceae 161**

Staphylea
Bumalda

**Styracaceae 242**

Styrax
japonica

**Tamaricaceae 191**

Tamarix
odessana
pentandra

**Tiliaceae 174**

Tilia
americana

**Ulmaceae 63**

Celtis
occidentalis

**Verbenaceae 253**

Callicarpa
Giraldii
japonica
Vitex
Agnus-castus
Negundo var. incisa

**Vitaceae 170**

Ampelopsis
heterophylla
Psedera
quinquefolia
Vitis
aestivale

## MONOCOTYLEDONES

**Dioscoreaceae 343**

Dioscorea
villosa

**Liliaceae 338**

Smilax
glauca
herbacea
pinnata
rotundifolia
trifolia
Yucca
filamentosa

# Seeds Collected in the Southern United States

## (Chiefly in Tennessee)

by Dr. H. K. Svenson

Abies
    Fraseri
Arabis
    lyrata
Arenaria
    patula
Belamcanda
    chinensis
Cercis
    canadensis
Cimicifuga
    americana
Clintonia
    borealis
Coreopsis
    tripteris
Diphyllaea
    cymosa
Dodecatheon
    Meadia
Eryngium
    aquaticum
    procumbens
Gillenia
    trifoliata
Helianthus
    laetiflorus
Heuchera
    macrorhiza
    villosa
Hibiscus
    militaris
Hydrophyllum
    sp.
Iris
    virginica (?)
Itea
    virginica
Liatris
    graminifolia
    spicata
Linaria
    Elatine
Lippia
    lanceolata
Parthenium
    integrifolium
Petalostemon
    Gattingeri
Polymnia
    Uvedalia
Rhus
    canadensis
Salvia
    lyrata
Satureia
    glabella
Saururus
    cernuus
Saxifraga
    leucanthemifolia
Scutellaria
    canescens
    integrifolia
Sedum
    ternatum
Stachys
    tenuifolia var. aspera
Streptopus
    roseus
Talinum
    teretifolium
Thaspium
    pinnatifidum
Trautvetteria
    carolinensis
Trillium
    erectum var. album
    undulatum
    Vaseyi

Viburnum
alnifolium
nudum
Vernonia
altissima
Xyris
caroliniana
Zanthorhiza
apiifolia

## Seeds Collected in Tennessee and Ohio

BY MR. A. J. SHARP

Actaea
alba
Arisaema
polymorpha
Asclepias
variegata
Aster
acuminatus
Caulophyllum
thalictroides
Cocculus
carolinus
Euonymus
americana
Eupatorium
urticaefolium
Ilex
monticola
Impatiens
pallida
Inula
Helenium
Penthorum
sedoides
Polygonatum
commutatum
Rhamnus
carolinianus
Senecio
Rugelia
Solidago
glomerata
Zanthoxylum
americanum

## Seeds Collected in Atkinson, North Carolina

BY MISS CALLIE HARRELL

Dionaea muscipula

Address requests for seeds to

SEED EXCHANGE,
Brooklyn Botanic Garden,
1000 Washington Ave.,
Brooklyn, N. Y.,
U. S. A.

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## GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

*Resigned December 11, 1930.

# PUBLICATIONS

## OF THE

# BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.50 a year, 25 cents a number. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

55. *Physiologic races of bunt of wheat.* 14 pages. 1928.

56. *The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

57. *New physiologic races of oat smuts.* 22 pages. 1930.

58. *A new method of producing and detecting sorghum hybrids.* 12 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record;* see above.

*Guide No. 3. The story of our metate: A chronicle of corn.* Illustrated. Published, December, 1929. (Brooklyn Bot. Gard. Record, 18[8]: 283–307.) Price, 25 cents.

*Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden.* Illustrated. Published, July, 1930. (Brooklyn Bot. Gard. Record, 19[4]: 197–234.) Price, 25 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 143 botanic gardens and institutions located in 42 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 48 countries.

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GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

# BROOKLYN BOTANIC GARDEN RECORD

VOL. XX MARCH, 1931 NO. 2



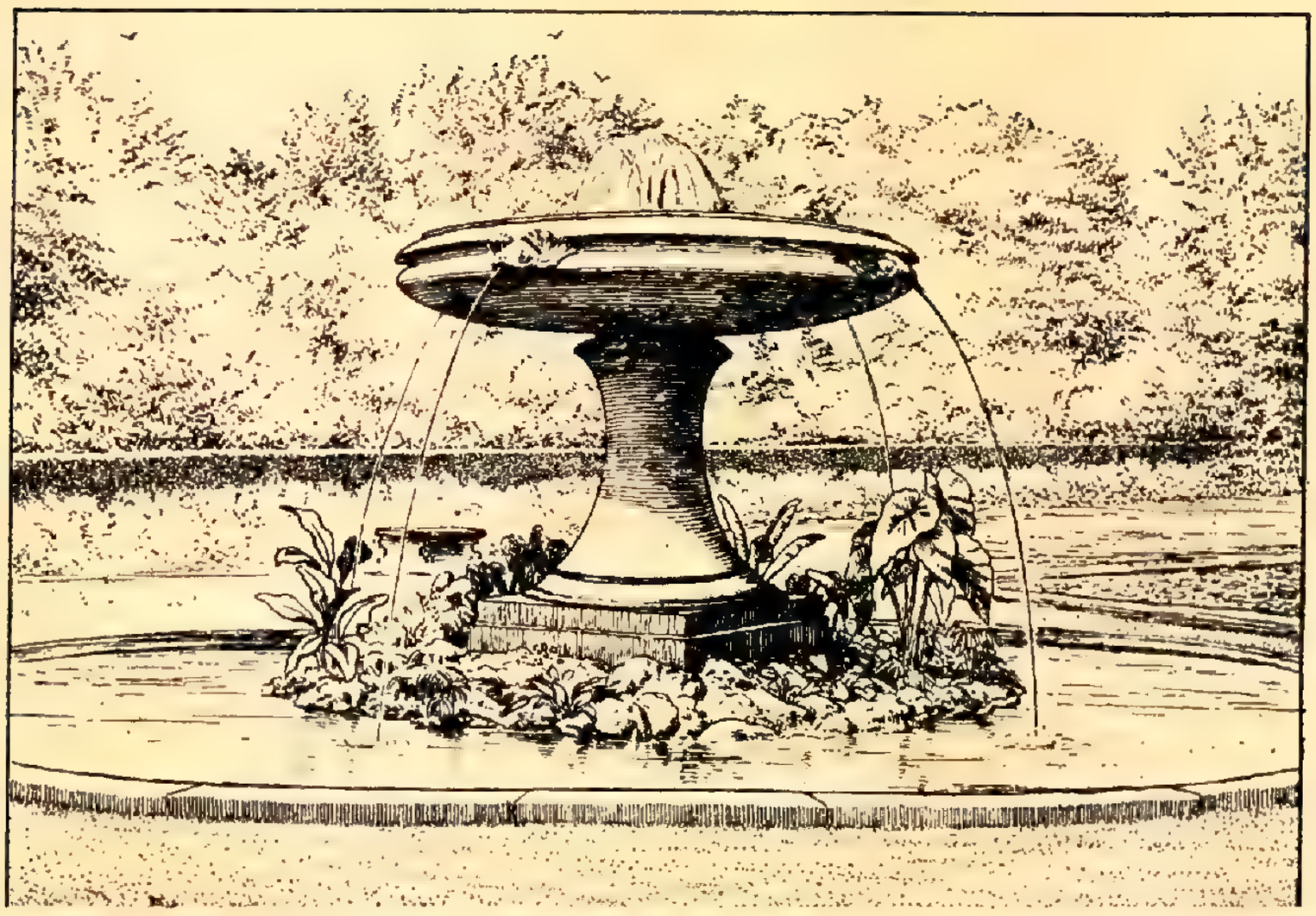
HERBARIUM OF
THOMAS J. DELENDICK


## TWENTIETH ANNUAL REPORT

OF THE

## BROOKLYN BOTANIC GARDEN

1930

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# TWENTIETH ANNUAL REPORT

OF THE

# BROOKLYN BOTANIC GARDEN

1930

HERBARIUM OF
THOMAS J. DELENDICK

BROOKLYN BOTANIC GARDEN
FOR THE ADVANCEMENT OF BOTANY
AND THE SERVICE OF THE CITY
MCMX
THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

FOR EDUCATION
FOR INVESTIGATION
FOR THE SERVICE OF THE CITY

BROOKLYN, N. Y.
MARCH, 1931

LANCASTER PRESS, INC.
LANCASTER, PA.

FIG. 1. Rose Garden, 1930. View looking south-west, showing lattice work Pavilion and three of the 32 new concrete posts to support festoons. The roses on the Pavilion bank are "Max Graf." The bed in the foreground contains "Soleil d'Or" and other Pernetiana roses. (6965.)

HERBARIUM OF
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# TWENTIETH ANNUAL REPORT

OF THE

# BROOKLYN BOTANIC GARDEN

1930 [1]

## REPORT OF THE DIRECTOR

To the Botanic Garden Governing Committee:

I have the honor to present herewith the twentieth annual report of the Brooklyn Botanic Garden, covering the year 1930.

### Looking Backward

Edward Bellamy looked backward by turning his back on the future and looking over his shoulder. This was a literary device for centering attention on things that ought to occur and were likely to occur. That is the only excuse for looking backward. Ten years ago we made our first backward glance and thereby found that the Botanic Garden had made some progress; but the new shibboleth, relativity, showed us that the place where we stood was much further from the goal than from the starting point. Such an experience is always a great stimulus while hope remains, and now, at the end of the second decade of the Botanic Garden, it may not be uninteresting, nor unprofitable to look backward once more, not to find justification for drawing the famous conclusion of Jack Horner, but to get a full measure of the incentive that comes from realizing how far we still are from the ideal of accomplishment. Perhaps it will be best to note first certain items of material well-being that may be stated statistically. Not that these things have been ends in themselves, or ever should be. They are only indexes of progress and means to an end—the fulfillment of the objects for which the Garden was established, namely, the advancement of botanical science and education. Without progress in material well-being, we should be seriously

[1] Brooklyn Botanic Garden Record, Vol. XX, No. 2, March, 1931.

handicapped in the really important essentials. The following items, therefore (Table I), are to be regarded merely as quantitative expressions of the fact that the Brooklyn Botanic Garden has made some progress during its first twenty years.

TABLE I

NUMERICAL COMPARISONS SHOWING THE GROWTH OF THE BROOKLYN BOTANIC GARDEN DURING ITS FIRST TWENTY YEARS

*The first entry is in the column indicating the year when the activity began*

| | 1910 | 1911 | 1920 | 1930 |
|---|---|---|---|---|
| 1. General attendance | | 10,000 | 312,000 | 1,006,027 |
| 2. Attendance at lectures and Garden classes | 200 | | 53,200 | 90,618 |
| 3. Attendance of school classes (Began 1913) | | (544) | 23,000 | 44,770 |
| 4. Percentage of all schools served | 1% | 5% | 82% | 94% |
| 5. Penny packets of seeds distributed (Began 1914) | | (25,000) | 128,500 | 740,791 |
| 6. Library: Number of books and pamphlets | 0 | 728 | 11,778 | 27,803 |
| 7. Herbarium: Approximate number of specimens | | 1,739 | 157,000 | 228,149 |
| 8. Number on monthly payroll | 1 | 5 | 41 | 56 |
| 10. Number of members | 0 | 0 | 572 | 1115 |
| 11. Tax Budget appropriation (Cents omitted) | $4,744 | $14,550 | $68,478 | $101,006 |
| 12. Private Funds Budget (Cents omitted) | 1,314 | 5,626 | 34,163 | 127,860 |
| 13. Tax Budget: Percentage of total budget | 78% | 72% | 67% | 44% |
| 14. Private Funds: Percentage of total budget | 22% | 28% | 33% | 56% |
| 15. Amount of Endowment | $50,000 | | $95,525 | $990,897 |

## What We Inherited from the City

The original 40 acres of the garden had been partly developed as Institute Park during the administration of Seth Low, mayor of Greater New York, and under the efficient administration of Hon. Richard Young, commissioner of parks for the boroughs of Brooklyn and Queens. Fortunately Commissioner Young had carried out here the inspired conception of Olmstead and Vaux, and had constructed along the east (Washington Avenue) and west (Flatbush Avenue) sides of the grounds substantial border mounds, well top-soiled and planted with a miscellaneous collection of trees and shrubs.

This idea was conceived by Messrs. Olmstead and Vaux in connection with the development of Central Park, New York, completed in 1858, and was repeated about nine years later as a feature of Prospect Park, Brooklyn, which was also designed by them. These border mounds, inside the fence, serve the purpose, often accomplished in European gardens by a high brick

FIG. 2. Presentation of the Richard Young Gate, May 13, 1930. View from Flatbush Avenue. From left to right: Mr. William T. Zartman, Miss Hilda Loines, Hon. Richard Young, Pres. Edward C. Blum, Dr. C. Stuart Gager, Mrs. Louise Warner. (Photo by Martin J. Kunkel. Courtesy, Eagle Photo.)

wall, of screening out the commotion and dust and, to a certain degree the distracting noise of the street. This is in recognition of the fact that a public garden (or park) is not a thing to be looked at from the street, but a place to go into, to escape from the streets and other aspects of the city—an attempt to preserve a bit of the country in urban surroundings.

Commissioner Young had also carried out the grading in such a way as to provide a diversified topography, with several attractive little hills, and a picturesque lake. Convenient gravel walks had also been made. Such was our inheritance.

## Progress of Development

But a botanic garden is more than a park, however much it may serve park purposes. In cooperation with Olmstead Brothers, landscape architects, comprehensive plans were made for the lay-out of the entire area as a botanic garden with specialized plantations, and special features such, for example, as the Brook, essential to provide diversified conditions for different kinds of plant life.

### *The First Governing Committee*

The first chairman of the Botanic Garden Governing Committee of our Trustees, Mr. Alfred T. White, was not only a man of great public spirit; he was also a trained engineer and an enthusiastic amateur field botanist, and his counsel and constructive suggestions, and very intelligent sympathy were of inestimable value during these early years; and these facts, combined with Mr. White's moral and financial support during the early years (until his death in 1921), insured more rapid and substantial progress than could have been possible without him. Mr. White also gathered about him from the membership of the Board of Trustees, a Governing Committee whose understanding interest made it a pleasure to meet and surmount difficulties that might otherwise have been only discouraging impediments. Among these men were President A. Augustus Healy, whose death in 1921 was a great loss. It should also be noted here that of the original Governing Committee, Mr. Gates D. Fahnestock and Mr. William A. Putnam are still members. The other two members of the origi-

nal committee were Mr. George D. Hearn, deceased, and Mr. George D. Pratt, who no longer resides in Brooklyn.

### *The Importance of Blue Prints*

After the initial grading, topsoiling, and construction of paths were completed, Mr. Harold A. Caparn was appointed consulting landscape architect, for a botanic garden must not only be botanic, it must be a garden, which should mean, of course, a place of beauty. "All science is crowned in art. For science, as for all the rest of man's experience, artistic expression is a crown of life, and *nothing is right until it is beautiful.*" [1]

A botanic garden needs the cooperation of the botanist and the landscape architect, for it should be not only a place where different kinds of plants are exhibited, but where they are exhibited effectively, and not only for their own sake (botanically), but as materials for decorative planting and landscaping, *i.e.,* horticulturally.

### *The North and South Additions*

After the first planting plans were made and in part realized, the city added to our original 40 acres two tracts since known as the North Addition and the South Addition. These increased the acreage to approximately fifty, and the plans were revised to provide additional features, and additional area for each feature and each group of plants.

It is not necessary here to relate in detail the steps in the gradual development of the plantations. The work is still under way. Let us hope that it always will be! "A finished museum," said a great museum administrator, "is a dead museum, and a dead museum is a useless museum." So it is with a botanic garden—with a university, with science and art and education.

### *Research and Education*

The inauguration and development of a program of botanical research and public education has gone forward *pari passu* with the development of the grounds, as our nineteen preceding annual

[1] Harry Emerson Fosdick, *Harper's Magazine,* January, 1931. The italics are the quoter's.

reports have recorded in detail. The fact is mentioned here merely to round out the picture in looking backward.

## Ideals for the Future

But looking backward shows us now, as it did ten years ago, that we are further from our goal than we are from our starting point.

### *A Perfectly Maintained Garden*

The owners of private places realize how essential it is to have constant contact with nature and with beauty. Except beautiful natural scenery, nothing meets this fundamental human need more completely than a beautiful garden.

For the majority of people in a great city like New York a private garden is quite impossible, and yet it is to their advantage, and so to the advantage of society as a whole, that this inborn love of plant life and beauty shall be satisfied.

Municipal parks meet the need of open spaces for light, air, and recreation, but lack the features necessary to stimulate and foster an interest in gardening and in wild and cultivated plants. For this a botanic garden is necessary.

Everyone familiar with the administration of public parks, and with their state of up-keep in most of our cities, realizes how far they fall below the standard and accomplishment of private places —below the standards of the park authorities, even, for it is probable that no park commissioner ever had appropriations sufficient for his own program and ideals.

While giving full measure of credit for the broad programs of park development and the generous appropriations for such purposes in this city and elsewhere, it will doubtless be generally recognized that public officials and the general public in the average American city need to be aroused to a fuller appreciation of the importance of parks and public gardens, and to higher ideals of maintenance, beauty, and educational ends.

### *A Wonderful Opportunity*

The Brooklyn Botanic Garden affords an opportunity for private munificence to provide a public garden as beautiful as our most

FIG. 3. Jenkins Fountain. September, 1930. (7030.)

beautiful private places, not only for the enjoyment of the masses, but as an object lesson of what is really possible in the way of a public garden perfectly maintained.

A public that has an opportunity to become familiar with a perfectly maintained botanic garden will have higher standards for public parks and gardens, and will demand of public officials greater efficiency and the approximation to higher ideals in public park and garden management.

In no American city is there a public park or garden that is in the same class as many private gardens in their suburbs, from the standpoint of design and maintenance. What a wonderful thing it would be if such a public garden could be provided for Greater New York.

These, then, are the ideals for the future of the Brooklyn Botanic Garden:

1. A beautiful public garden, perfectly maintained.
2. Increase of our knowledge of plant life and gardening.
3. Public education for adults and children on every aspect of plant life and ornamental horticulture.

For the realization of this aim the Brooklyn Botanic Garden is ideally located. It is near the geographic center of the greater city's largest borough, and is surrounded on all sides by a larger population—within a half hour's ride or less—than any other botanic garden in the world.

In addition to the large general population surrounding it, the Botanic Garden is accessible, by a ride of less than one hour, to the student bodies of seven universities and colleges having a combined attendance of approximately 100,000 students, coming from nearly every state in the Union and from nearly every civilized country.

## *An Urgent Need*

Although the Brooklyn Botanic Garden is now twenty years old, its small area of only 50 acres is not yet fully developed. Several acres are still under the plow.

*Compared to the standards of private places the entire area of the Botanic Garden is underdeveloped and inadequately maintained.*

This condition is due solely to lack of sufficient funds.

Our ideal is to create here the most beautiful spot in Greater New York—a garden of rare beauty and design, perfectly maintained, and with its value enhanced many fold by the educational and scientific work carried on.

It is hardly possible to exaggerate the civic and educational importance of the realization of this ideal—what it would mean as a standard of excellence for public parks and gardens, as a stimulus to private gardening and interest in horticulture, as a contribution to public education and the advancement of a knowledge and love of plant life.

Said George Brown Good, in the Smithsonian Report for 1897, "The National Museum has 300,000 visitors a year, *each of whom carries away a certain number of new thoughts.*" What thoughts and ideas would one carry away from visiting a perfectly maintained public garden? No portion of the American public has ever yet had such an opportunity, for no American public garden has ever had sufficient funds to make perfect maintenance possible.

### *Who Should Be Interested?*

With the constantly increasing number of persons interested in horticulture and all aspects of plant life throughout the country, and especially in the vicinity of this city, is it not reasonable to expect a sympathetic appreciation of the importance of the ideal here set forth, and generous support for its realization? As this interest spreads and deepens there is bound to be increasing support of botanic gardens.

## What Makes a City Great?

During the year the Brooklyn Chamber of Commerce issued a folder calling attention to the industrial and commercial rank of Brooklyn. The increase in population during the past ten years was in excess of 600,000. This is at the average rate of 160 persons or nearly 40 families of four persons each per day for a decade, making Brooklyn the third largest municipal city in the western hemisphere, exceeded by only Greater New York (of which Brooklyn is a part) and Chicago. As a shipping center

Brooklyn ranks second in America; as a manufacturing center fifth. The manufactured products of Brooklyn now amount, in round numbers, to $1,400,000,000 a year. The wholesale products amount to $3,000,000,000 annually.

The figures of the 1930 U. S. census show that the population of Brooklyn (2,596,154) has increased over 28 per cent. since 1920. The attendance at the Brooklyn Botanic Garden for the same period increased from 312,000 to 1,006,000 or 222 per cent. The Tax Budget appropriation of the City of New York for the maintenance of the Garden increased $32,528 (from $68,478 to $101,006), or 48 per cent., and the Private Funds Budget $62,266 (from $34,163 to $96,429), or 182 per cent.

The circular above quoted also records the activity of the Chamber in connection with the recent establishment of Long Island University (1926), Brooklyn College (1929), and the new Technical High School building soon to be constructed at a cost of approximately $7,000,000, to provide vocational training. Everyone interested in Brooklyn may well be proud of this splendid accomplishment and growth.

But what is it that makes a city truly and permanently great? There were much larger mediaeval cities than Pisa, Florence, and Padua. Whoever thinks now of the size of Athens during the period of classic Greece, or of the commerce of Alexandria? To mention these cities is to suggest the names of Galileo, Giotto, Vesalius, and Dante: Pericles and Aristotle; a great university (Padua), surpassing architecture (Athens and Pisa), literature that lives for more than 2000 years (Athens); a great library (Alexandria); parks or groves where people went, not to eat lunches, play games, and litter up the place, but to walk and talk with philosophers. We forget that Florence and Padua are and have been important centers of manufacturing and commerce, that Alexandria was a great shipping center. To mention Milan is to think "Cathedral" and "Leonardo da Vinci," forgetting and not much caring, that there is the financial center of Italy and a great manufacturing center.

It is by no means intended here to endeavor to belittle the importance of trade and commerce, but it is the intention to emphasize the mistake of any city stressing and supporting these things to the exclusion of things of the spirit.

When a city endeavors to bring to itself a larger factory, no inducements can outweigh the educational and cultural advantages which the place offers as a residence for the families of the proprietor and his employees. What boots it that one can make large dividends or high wages if the community does not afford a healthy environment and enriching cultural opportunities for owners and employees and their families.

These paragraphs, which may seem far a field in the report of a botanic garden, are preparatory to the statement that an educational institution like the Brooklyn Botanic Garden, having more than 1,000,000 visitors yearly in a city of two and one half million population, and which renders to the community such diversified and extensive services as have been recorded in these annual reports for the past twenty years, should receive support in proportion to the value of its services and the resources of the community. One might, for example, expect that more than 627 persons could be found to enroll as annual members as the result of daily canvassing for several years by all the methods that have been found effective elsewhere. Such expectations might be increased by knowledge of the fact that cities less than half the size of Brooklyn far exceed Brooklyn in such matters.

It would be difficult to exaggerate the cultural impoverishment of Brooklyn if it were to be deprived of such institutions as the Botanic Garden, the Brooklyn Museum, and the Children's Museum, all open free to the public, and not only carrying on their own educational programs, for children and adults, but supplementing and enriching the work of practically every other educational institution in the city.

Brooklyn has been placed under an everlasting debt of gratitude to the small handful of citizens whose contributions of services, moral support, and funds, in supplement to the annual tax budget appropriations, have made the Brooklyn Botanic Garden possible. Without this private initiative and support much of the beauty of our grounds, and much—very much—of our scientific and educational work, including a large part of our service to the public schools, would have been quite impossible.

At the close of these first twenty years the director wishes to express again his appreciation and deep sense of personal obliga-

tion to those who have given such generous measure of support, be it large or small.

## Need of Additional Endowment

A detailed statement of our endowment needs has been given in previous annual reports. It should be kept in mind that funds are needed not only for the development and maintenance of the grounds, but to finance the scientific research (which is foundational to all else that we do) and the program of public education. For much of our work we are dependent on the uncertain income of pledges made annually; the work itself is permanently essential. Our program of development has, as yet, been only partially realized.

For the enrichment of work now in progress, for its logical expansion, to meet increasing demands for public service, and to provide compensation comparable to what is being paid in other scientific and educational institutions, and to put this work on a permanent financial basis the Brooklyn Botanic Garden needs additional annual income equivalent to the interest at 5½ per cent. on One Million Dollars.

"Real endowments are not money, but ideas," says Mr. Julius Rosenwald in his recent article [1] urging the unwisdom of perpetual endowments for specific purposes: "Desirable and feasible ideas are of much more value than money, and when their influence has once been established they may be expected to receive ready support as long as they justify themselves. We may be confident that if a public need is clearly demonstrated, and a practicable way of meeting that need is shown, society will take care of it in the future."

We believe that the history of the past twenty years has clearly demonstrated a real need for such services as the Brooklyn Botanic Garden has rendered and is rendering to this community and to the larger world of science and education. Is it too much to hope that "society" will, as Mr. Rosenwald assures us it will, provide the "practicable way" to make possible the continuation of, and the enrichment and extension of our work?

[1] *Atlantic Monthly*, December, 1930, p. 749.

FIG. 4. Conservatory Plaza, facing north, showing the new Jenkins Fountain, the Tropical Waterlily Pool, the new Steps, with Water Basin between, and the stone railing at the south end of the Laboratory Plaza. September, 1930. (7031.)

The following items reflect, in part, the activities and progress of the year 1930.

## The Garden and the Public

It is gratifying each year to witness the extent to which the general public visit the garden as one would visit a museum, for study as well as recreation and enjoyment. One can rarely walk through the grounds without seeing visitors reading and copying labels, studying plants, and learning their names. An increasing number of visitors come to the Information Desk in the Laboratory Building for printed matter, or to ask for information. Inquiries by mail and telephone have fully doubled in number during the past ten years.

By means of frequent press releases sent out by our Feature News Service the public is kept well informed concerning the Garden. During 1930 about 750 clippings of news items were received. The series of 51 weekly articles on plant life and gardening contributed to the New York *Sun* during the year, as noted in the appended report of the curator of elementary instruction, have resulted in the establishment of a garden page in that paper.

## The Garden and the Schools

As noted in the appended report of the curator of public instruction, the Botanic Garden during the past year, has served, in one way or another, every High School in Greater New York, save one (the High School of Commerce, Manhattan) which has no department of biology. This includes 24 schools and annexes in Brooklyn, 14 in Manhattan, 6 in the Bronx, 10 in Queens, and 3 in Richmond (Staten Island), a total of 57 schools. In each case this service has included the supply of living or preserved study material.

In a similar manner we have supplied six colleges and universities and one Junior college in Greater New York, and one in New Jersey; also the eleven private and parochial schools of high school grade and the Maxwell Training School (and Annex) in Brooklyn, and the New York Training School for Teachers in Manhattan.

In numerous ways we have also served 82 per cent. of the Public Schools (grades below the High School) in 1930, and 98 per

cent. during the past ten years; of the Junior High Schools, 81 per cent. in 1930 and 85 per cent. during the past ten years.

This cooperation has been up to our capacity to respond, and the service could be enriched and extended if we had larger appropriations for this purpose in the Tax Budget. As it is, much of the cost of the service has to be met from private funds income, to the impoverishment of our scientific work, and the extension and maintenance of our collections of living plants, the herbarium, and the library, which are entirely financed from private funds. Fuller statements of the work are given in the appended reports of the curators of public instruction and elementary instruction, and in Table II.

## The City and the Garden for Twenty Years

It may be of interest, both locally and in other cities to know just what advantage the city has derived, in terms of dollars and cents, by the co-partnership with the Botanic Garden during the past twenty years.

By expending a total of approximately $376,422 in corporate stock, tax notes, and special revenue bonds for permanent improvements the city has secured the expenditure of approximately $176,270 of private funds for the same purpose—the permanent improvement of city owned property.

Since the Garden was established in 1910 the annual appropriations of the City for maintenance (not including permanent improvements) have totaled $1,290,026.41. By making these appropriations the City has secured twenty annual appropriations of private funds amounting to a total of $814,859.41. The total maintenance cost, therefore, has been $2,104,885.82.

The total number of visitors to the Garden during its first 20 years is approximately 9,000,000.

The maintenance, therefore, has, for the 20 year period, cost 23 cents per visitor or only 1.15 cents per year per visitor. Of this amount the City has paid in the Tax Budget appropriations for the 20 year period only 14 cents per visitor, or only 0.7 cent. In other words, the Garden has cost the City less than three quarters of a cent per year per visitor.

The Tax Budget appropriation of $101,006.67 for maintenance

# TABLE II

## Statistics of School Service

| | 1930 | 1929 |
|---|---|---|
| *Conferences with Teachers* | | |
| No. of conferences | 49 | 7 |
| No. of teachers involved | 3,731 | 288 |
| No. of pupils involved | 196,590 | 14,023 |
| *Loan Lectures (Lantern Slides, etc.)* | | |
| No. of sets lent | 33 | 27 |
| No. of teachers involved | 332 | 97 |
| No. of pupils attending | 13,756 | 6,000 |
| *Material Supplied* | | |
| Total number of requests from schools | 437 | 443 |
| Number of different schools | 137 | 140 |
| High Schools & H. S. Annexes | | |
| Brooklyn (Total No. 33) | 25 | 24 |
| Queens (Total No. 13) | 10 | 7 |
| Manhattan (Total No. 28) | 14 | 14 |
| Other Boroughs (Total No. 16) | 9 | 14 |
| Junior High Schools (Total in Brooklyn, 17) | 22 | 18 |
| Colleges and Universities (Total in Brooklyn, 7) | 9 | 11 |
| Training Schools (Total in Brooklyn, 2) | 3 | 4 |
| Elementary | | |
| Brooklyn (Total No. 235) | 29 | 29 |
| Queens (Total No. 150) | 1 | 0 |
| Manhattan (Total No. 192) | 3 | 2 |
| Other Boroughs (Total No. 137) | 1 | 1 |
| Private and Parochial | | |
| High | 5 | 6 |
| Elementary | 6 | 6 |
| Other Institutions | 13 | 8 |
| No. of potted plants for nature study | 4,015 | 3,956 |
| No. of Petri dishes filled with agar | 5,226 | 4,134 |
| Total number of teachers supplied | 4,811 | 6,457 |
| Total number of pupils reached | 196,177 | 282,299 |
| *Living Plants Placed in School Rooms* | | |
| No. of schools | 48 | 41 |
| No. plants | 420 | 307 |
| No. teachers | 1,406 | 441 |
| No. of pupils | 51,762 | 21,357 |
| *Plants Distributed (Raised in Classes)* | 16,165 | 22,596 |
| No. of teachers taking plants | 709 | 713 |
| No. of children taking plants | 1,596 | 3,298 |
| Total number of schools represented | 534 | 393 |
| *Seed Packets for Children* | | |
| No. of schools | 429 | 437 |
| No. of teachers | 6,178 | 6,591 |
| No. of pupils | 246,965 | 263,662 |
| No. of packets | 740,791 | 792,014 |
| *Exhibits Provided* | | |
| No. of exhibits | 17 | 36 |
| Viewed by | 42,600 | 31,744 |

for 1930 was an average of 1.7 cents for each of the 6,000,000 inhabitants of Greater New York.

In addition to securing these generous contributions of private funds, the city has benefited by the permanent improvement of 50 acres of park land; by the development of a scientific and educational institution not only serving important needs of the local public, but also the larger needs of science and education throughout the world; by the development of a free public library on all aspects of plant life; and by the establishment of an institution which cooperates to enrich the public school system and the work of every higher educational institution in the entire Greater City. Through its Botanic Garden, Brooklyn enjoys educational and other civic advantages which are available to only four or five other cities in the United States. Several of these advantages are unique for Brooklyn.

## Research During 1930

*Expeditions.*—In addition to investigations carried on locally in laboratories, herbaria, and experimental garden, during 1930, there have been two expeditions for field work, namely, Dr. Reed's trip to Japan primarily for the study of Beardless Iris, and to the northwestern United States to study cereal grains with special reference to pathology; and Dr. Svenson's trip to the Galapagos Islands, as botanist of the Astor expedition. Preliminary reports on these trips were published in the Brooklyn Botanic Garden RECORD for November, and further reports will be found on pages 78 and 90 *infra*.

*Needs.*—The curatorship of plant breeding, which became vacant in 1927 has, for lack of funds, not been filled. In most of our colleges and universities, especially in the State Agricultural Colleges and experiment stations, genetics work with plants is carried on with special reference to agricultural crop plants. It is highly desirable that more genetics work should be done with what is sometimes called "floristic" material, the cultivated ornamental plants and their wild relatives. It is particularly appropriate that this material should be the basis of work in an urban botanic garden.

Our rose garden, with its growing collection of wild species as

well as horticultural varieties, not only affords a favorable opportunity for such work here, but creates a need for it, and it is hoped that funds may soon become available for the initiation of work in plant breeding with special reference to the genetics of roses and other ornamentals.

*Research Papers Published.*—The total number of research papers published by the Garden in 1930 was 142, occupying 2451 pages. These include the papers by those not members of the Garden staff, published in *American Journal of Botany, Ecology,* and *Genetics.*

Special reports on Research during 1930 may be found on pages 78–91.

## Library

*New Library Stacks.*—As stated in the preceding annual report, the lowest bid for new metal library stacks was $3,426.23, received from the Art Metal Construction Co. The contract (Park Department No. 97422) was awarded to the lowest bidder and the work was completed March 25. This additional equipment not only met a pressing need, but has added much to the attractiveness of the library.

*Growth and Use.*—As noted in Table I, page 42, the total number of volumes and pamphlets has increased from 11,778 in 1920 to 27,776 at the close of 1930. Special attention is called to the important accessions, including the Pre-Linnaean works, the autograph letters and portraits of botanists, and association books, as noted by the librarian in his appended report.

The increased use of the library from approximately 1400 in 1920 to more than 3100 in 1930 is gratifying. It should be kept in mind in this connection that this is a reference library, no books being loaned to individuals.

## Herbarium

*New Cases.*—As recorded in the previous report, the contract (Park Department No. 96148) for supplying the new metal herbarium cases was executed on November 21, 1929, with the Jamestown Metal Equipment Co. The work of installation was completed on February 3, at a cost of $5,957. This nearly doubles

the capacity of the cases, and provides a more satisfactory arrangement of the main room.

*Component Collections.*—Additional assistants, supplied during the latter part of 1930 by the Emergency Work Bureau, have made it possible, under Dr. Svenson's supervision, to mount a large quantity of hitherto unmounted material and incorporate it into the active collection. Attention is called to the statement (on page 92) of new collections added to the herbarium of flowering plants.

## *The Purposes of a Herbarium*

Perhaps no portion of botanic garden equipment is more difficult to explain to a layman than the herbarium. A library is understood; at least most people *think* they understand the uses and value of a library. A collection of living plants in a garden is understood. A botanical museum, comprising labeled specimens effectively exhibited has meaning to the layman. But what is the use of a collection of dried plants, pasted to herbarium sheets, labeled, *and then filed away in the compartments of herbarium cases?*

Sir Joseph Hooker, the famous director of the Royal Botanic Gardens at Kew, had his troubles in trying to make government officials understand various needs of a botanic garden, among them, the needs of a herbarium. In a letter to Huxley in 1858, speaking of the necessity of a herbarium at Kew, he notes that, "it is impossible to work scientifically a garden of 20,000 to 30,000 species, and name the things sent to us to name, without a first rate Herbarium and Library here. The seeds sent are often to be known only by the accompanying dried specimens which go into the Herbarium, and the latter becomes in a thousand ways an indispensable adjunct to the Garden and reciprocally (by being the depository of the plants once cultivated in the Garden) an integral part of the establishment, and a record of its progress and efforts, its successes and failures as a horticultural establishment, all quite apart from its scientific uses."

Later, when the Lemann herbarium of 30,000 specimens was offered as a gift to Cambridge University, Hooker refers to his old teacher Henslow trying to prove to the Cambridge Dons "that such collections have other and higher value than old china"!

In a letter to W. H. Harvey, in 1857, Hooker writes "We have just drawn up the Garden Report and pitched in very strong about the uses of the Herbarium as a scientific adjunct to the Gardens."

Perhaps it may not be amiss to give here a brief statement, for layman consumption, of what the botanist conceives the uses of a herbarium to be.

Dr. David Fairchild, of the U. S. Department of Agriculture, in his recent book, *Exploring for plants* (MacMillan, 1930), writes as follows:

"To those who hurry through life the hundreds of cases in the Kew Herbarium contain only so much dried plant material; mummies having little relation to the actual plants, fragments of flowers and leaves, brown with age and often falling to pieces. Such as these do not realize, I think, that although you can describe a plant species in words, if you are clever enough, it is vastly more difficult to tell from the verbal description whether some plant which you have in your hand is that plant or not, than it is to turn to a dried specimen of it in a herbarium and compare its form with the one you have."

As Hooker stated, a well-kept botanic garden without some sort of herbarium is well-nigh an impossibility. Besides the constant utilization of our herbarium for comparison and naming of material which is sent us for identification, and the continuous reference made to it in the identification and selection of material for our plantations and conservatories, it is also an important adjunct in classroom instruction, including courses given on medicinal and other economic plants. Numerous problems are brought to us during the year the only solution to which lies in the herbarium collections.

The herbarium also serves as the basis of work on our local flora, for it includes the actual plants once growing in localities now completely covered by the urban expansion of New York City. We are specially interested in Long Island. In order to understand the place of our own flora we must have comparative material of the same and related species from other regions.

In general, for researches relative to plant classification it is necessary to depend on herbaria. Their collections are more extensive and diversified than the necessarily limited collections of

living plants. While botanic gardens can, at best, cultivate but a few thousand species, great herbaria contain millions of dried specimens. Further, many plant families are, for one reason or another, not suitable for cultivation and it is desirable that they be represented by at least a few herbarium specimens.

In addition, we have the material (some of it tropical) which has been accumulated on expeditions in which members of the Brooklyn Botanic Garden have participated and which has been the basis of the published results of the explorations. A knowledge of the flora of many regions has been made possible by the study of herbarium specimens collected by travellers who were not botanists.

Herbarium material is also indispensable to investigators who are doing monographic work on different plant groups or regions. In fact, most systematic work must be done with preserved specimens, the plants being collected in the field but studied at convenience and leisure in the herbarium. The specialist may thus have at his disposal a rich representation of a given group or region, and moreover all the specimens in a herbarium are, so to speak, "in flower" at the same time and at all seasons of the year. Reciprocally, such work always benefits a herbarium, which steadily increases in value as careful arrangement and authoritative determinations of its specimens are made. Mere size is not, of itself, an indication of the value of a collection, but rather the state of organization, perfection of the specimens, availability for reference, and the degree of reliability of carefully selected material for desired purposes.

The scientific value of a herbarium is enhanced by the "type" specimens it contains. A "type" specimen may, in general, be defined as the specimen on which the original description of a species is based. Our own herbarium possesses many type specimens, especially in the group of the Fungi.

A herbarium is also of value in numerous incidental ways such, for example, as the preparation of illustrations for botanical publications, herbarium material being available in rich variety at any season of the year. In several instances, herbarium specimens have supplied very old seeds of definitely known age for experimental studies of the longevity of seeds. These studies, in turn,

afforded evidence disproving the widespread myth of the germination of "mummy wheat," claimed to be several thousand years old. Herbarium specimens of Lamarck's Evening-primrose and other species of the genus *Oenothera* became of the highest interest and importance in connection with testing the hypothesis of evolution by "mutation," as elaborated by DeVries about 25 years ago, and still being investigated. These last two points are interesting illustrations of the fact that work in "pure" science, the collection of specimens and data, is often found to have a value wholly unanticipated when the work was done.

And finally (for this is not intended to be an exhaustive treatment of the subject) herbaria are indispensable in connection with studies in preparation for journeys of botanical exploration for extending our knowledge of plants, giving the botanical explorer, in advance, a first hand acquaintance with what is already known of the relevant flora—a preparation which no amount of reading printed descriptions could give.

From this statement the need of curatorial oversight and adequate assistance should be clear. The mounting of new specimens and assorting them into the collection, keeping the specimens free from insect pests, serving those who are studing the collection, preparing duplicate specimens for exchange—these and other curatorial details demand constant and trained oversight and attention.

Just as in a museum the library and the study collections are most useful to the educated while the public exhibits are useful to the educated and uneducated alike, and are a mental stimulus to both classes, so in a botanic garden the public exhibits appeal to the masses (botanists, horticulturists, and laymen), but the herbarium (as well as the library) serves chiefly the needs of the amateur plant-lover and the professional botanist.

## Plantations and Grounds

Outdoor gardening work was resumed on March 17 with a force of ten gardeners, two of whom are required for the Conservatories, leaving only eight to care for approximately 30 acres of plantations, including such highly specialized areas as the Rose Garden, Rock Garden, and Japanese Garden. The Native Wild

FIG. 5. Rhododendrons at the outlet of the Lake. June, 1930. (7035.)

Flower Garden and the Economic Plant Garden have remained temporarily abandoned for several years for lack of sufficient gardening force to maintain them if they were reestablished. The grading and development of the Horticultural Section on the North Addition (between the Museum and the Reservoir) which is planned for 1931 will necessitate additional gardeners for maintenance and guard duty.

### *Twelve Months of Bloom*

The Christmas Iris (*Iris Vartani*), a bulbous species which normally blooms in December in its native home in Palestine, was in bloom in the Rock Garden for several days beginning January 6. Snowdrops began blooming about February 2, and a number of yellow Crocuses were in flower on March 10, preceded, as usual, by the Winter Aconite. Thence we had a continuous succession of bloom throughout the entire twelve months of 1930, ending with *Crocus salzmanni* and *Crocus longifolia* which were in bloom in the Rock Garden in December.

### *Rose Garden*

The roses wintered well over the season of 1929–30. The garden has been greatly improved by adding lattice panels and pillars to the north pergola and by the concrete posts to hold festoon chains. A more detailed statement concerning the Rose Garden is given in the appended report of the horticulturist.

### *Japanese Garden*

When an art museum obtains an oil painting of a landscape and hangs it in the proper gallery the major cost for that exhibit has been met for all time. The same is true of a collection of wax models of flowers or any other exhibit in a natural history museum. Not so with a garden of living plants. The cost of construction and first planting of a rose garden, rock garden, Japanese garden, is only a beginning. Considerable sums for maintenance, replanting, and care of plants must be provided from some source every year. Our Japanese Garden was constructed with private funds provided by our first chairman, Mr. Alfred T. White. The

expense of annual maintenance has likewise been almost wholly met (entirely so except for the wages of a guard in attendance) by generous gifts of private funds. A larger gift than usual in 1930 made it possible to give a great deal of attention to the plants, and this work has been carried out by Japanese gardeners under the supervision of Miss Mary Averill, honorary curator of Japanese gardening. The planting of additional flowering cherry trees in the immediate vicinity of the Japanese Garden is noted in the appended report of the horticulturist.

The larger bridge in the garden, completed in 1915, has become unsafe after fifteen years of continuous use and must be rebuilt this coming year. Numerous other repairs must also be made, and it is a great pleasure to record here that funds have already been pledged to the amount of $1500 to make possible this work.

### *Wild Flower Garden*

*Enclosure and Gates.*—Work on the erection of a fence to enclose the Native Wild Flower Garden, and the erection of the two rustic gates designed by Mr. Caparn, was begun about September 15 and completed about September 30. The gates are of wooden frames and chestnut poles (DuBois French Provincial Woven Wood Fence material) with 30 feet of the woven wood fence on each side of the gates, furnished and erected by the Robert C. Reeves Co. The remainder of the fence is of Anchor Post galvanized wire chain link fencing. This work was also made possible by a gift of $1610.22 by Mr. Jenkins.

*Planting Plans.*—This area was, of necessity, temporarily discontinued in 1924, largely for lack of funds. In the meantime a small grove, planted in that year, has developed sufficiently to provide the shade and moisture conditions of a small open woods.

During late November and December much pruning was done, and work was commenced on the construction of a Sand Barren Pool, where we hope to be able to establish under fairly natural conditions such local flora plants as are found in that kind of a habitat.

### *Conservatory Fountain*

The design for the Conservatory Plaza Fountain, by the consulting landscape architect, Mr. Harold A. Caparn, was approved by the Art Commission of New York City on April 9. This

design was published in the Botanic Garden RECORD for May, 1930, and the finished fountain is illustrated in fig. 1 of this report. The fountain is of Indiana limestone.

The four bronze heads at the outlets of the bowl were designed by Miss Isabel M. Kimball, sculptor, of Brooklyn, the design being based on the head of a Catfish or Bullhead, whose body is imagined to extend back into the water of the bowl. The heads were cast and placed by The Gorham Company (Bronze Division), of New York.

The contractor for labor and materials for the limestone bowl, pedestal, and base and for the stone and cement work for the lower basin was Wm. F. Evans & Son Building Co., Brooklyn. The work was completed on August 26.

### *Laboratory and Conservatory Plazas*

Work on the first contract (Park Department No. 98166) for the improvement of the Laboratory and Conservatory Plazas was begun on March 22 by the lowest bidder, the F. A. Ryan Construction Corporation (F. A. Ryan, Jr., President). The contract price was $14,900, and the contract time was 90 working days. With extras allowed the total cost of the work was $15,049, leaving an unincumbered balance of $5951. The official date for beginning the work was May 26, and the work was officially completed October 7.

*Second Contract.*—Plans for further improvements of the plazas, the cost not to exceed the unincumbered balance, were filed by Mr. Caparn with the Department of Parks, Brooklyn, in the latter part of June.

### *North Addition*

Plans for the improvement of the land between Brooklyn Museum property and Mt. Prospect Reservoir, known as the North Addition, are progressing. There have been unavoidable delays. It is expected that the contract can be advertised for public letting in the spring of 1931. The appropriation for this work is $24,100 made by the Board of Estimate and Apportionment.

## *Guards at the Gates*

A news item in the New York *Times* states that park vandalism, in Central Park alone, has cost the city $200,000 in three years. The vandalism included injuries to benches and sprinkling system, the uprooting of entire trees, shrubs, and hedges, and other damage. Among the items listed are: 15 large trees above four feet caliper badly mutilated; 204 shrubs stolen; 4729 shrubs destroyed; large areas of ground-cover plants destroyed by tramping. The landscape architect and chief engineer of the Park Department are quoted as estimating that about 40 per cent. of the rehabilitation work accomplished during the past three years at a cost of $500,000 has been undone by vandals. As a result the Fifth Avenue Association has asked the Board of Estimate and Apportionment for an appropriation for special park police to supplement the regular police.

We have had occasion in several preceding annual reports to note distressing acts of vandalism in the Brooklyn Botanic Garden, and reference is made to the trouble in Central Park as illustrating the fact that this Botanic Garden is not unique, in this respect. The situation has steadily improved here, and it is instructive to note that it is the very remedy recommended by the Fifth Avenue Association for Central Park that has proved effective here. In particular the plan, adopted for the first time in 1930, of having a guard at every entrance to the Garden has probably accomplished more than any other one thing by refusing admission to vagrants, "gangs" of adolescents, children unaccompanied by parent or other adult responsible for their conduct, and other persons obviously undesirable. This plan was begun on Saturday, April 12, and continued until October, with the exception of one week following Easter Sunday.

The plan was made possible by a supplementary appropriation of $2000 made by the city on March 28 for per diem labor. But this is not, of itself, sufficient. Respectable looking parents have been known, in this Garden, to deliberately set young children over a low wire fence into a plantation of Daffodils, and watch them pick generous handfuls of the flowers. Such instances emphasize the need of ample provision for guards in addition to those at the gates. There is slight satisfaction and no real restitution in having a vandal arrested and fined Five Dollars for destroying a rare

shrub of several years development or one that was perhaps obtained on some exploring expedition, and that can be replaced only in the distant future, if at all, because it is not on the market nor found in duplicate in other gardens. What false economy to expend money for the development of a beautiful garden and then not spend as much as may be necessary to prevent vandals doing more dollars worth of damage than it would cost to have the Garden properly policed.

It is important also to have guards at the gates to sell guide books, maps, and post-cards, and to give entering visitors information as to the location of various exhibits, et cetera.

### *Miscellaneous*

*Foot Bridge.*—A foot bridge over the Brook, at the outlet of the Lake, was one of the needed features illustrated in the Garden RECORD for May, 1930. Work on the construction of the bridge was begun by John Thatcher & Son, contractors, on June 3 and completed on June 30. This bridge, designed by Mr. Caparn, was made possible by a gift of $1500 for this purpose by Mr. Alfred W. Jenkins, of the Botanic Garden Governing Committee.

*Sidewalk Paving.*—On February 28, the Board of Estimate and Apportionment, at the request of the Park Commissioner, James J. Browne, approved the contract, plans, and specifications for the construction and new alignment of new cement walks, replacing an old flagstone paving and an unpaved stretch extending from the Richard Young Gate, near Empire Boulevard, north to the service gate on Flatbush Avenue, at an estimated cost of $2,010. Work began on this contract on May 5 and was concluded in about three weeks. The improvement had been greatly needed for a number of years. The cooperation of Park Commissioner Browne is specially appreciated, the expense being met from Park Department funds.

*Passing of the Water Tower.*—Ever since the Botanic Garden was established all views facing north have had their beauty enhanced by the beautiful stone water tower that stood at the northwest corner of Mt. Prospect Reservoir, on Eastern Parkway. This tower is now no more. Constructed in 1893 at a cost of $95,000, it was demolished in January, 1930 to save an expenditure of ap-

proximately $100,000, the estimated cost of strengthening its foundations in connection with the building of the second section of the Brooklyn Public Library located just west of the site of the tower. The necessity for its removal, regretted by the entire city, was predicted when the present site of the new library building was selected.

*Hardiness of Nelumbo.*—Although certain species of palms and of broad leaved evergreens (e.g., *Prunus laurocerasus*) are hardy at Kew, and not at Brooklyn, the Director of Kew, Dr. Hill, when visiting the Brooklyn Garden in 1926, was impressed with the vigorous growth in our Lake of the East Indian Lotus (*Nelumbo nucifera*), which had not proved hardy at Kew. At Dr. Hill's suggestion sections of rootstocks were sent to Kew for propagation. In a letter received here in February Dr. Hill wrote that, although the winters at Kew are milder than those at Brooklyn, the *Nelumbo* propagated from our plants had failed to prove hardy. The explanation for this is not certain, but it may possibly be that the explanation is to be found in the fact that the summers at Kew are not hot and dry enough to ripen the *Nelumbo* tissues properly for withstanding the winter weather.

## Conservatories

Attendance at the conservatories increased from 32,880 in 1929 to 40,093 in 1930. Several houses have been rearranged and new features added, such as aquatic plants in aquaria, plants useful as houseplants in steam-heated city apartments, etc. A fuller account is given in the appended report of the curator of plants.

## Exhibits

During the year 17 exhibits were installed outside of the Garden, with a total attendance of 42,600. Among these exhibits may be mentioned the one beginning April 5, in the department store of Abraham and Straus, Inc., Brooklyn, in connection with a series of talks on gardening as noted in the appended report of the curator of elementary instruction.

From April 18 to 27, there was a double-window display of material relating to the Botanic Garden in the show windows of the Abraham and Straus store. This fine courtesy was arranged through the good offices of our president, Mr. Blum.

Special attention is called to the account of our exhibit in the Brooklyn Savings Bank from November 17 to December 6, recorded in the appended report of the curator of public instruction under whose general supervision this attractive exhibit was installed.

## Cooperation

In our annual report for 1925 we gave a list of 840 institutions with which the Brooklyn Botanic Garden had been in cooperation that year. Such work has now become a daily occurrence, and there would be little point in trying to give a complete list of instances. It is gratifying, however, that we can now repay, in some measure, the very heavy indebtedness incurred in the earlier years of our own development; a few instances may be worth recording as indicating the diversity of this work and its geographic range.

In February our plan of organization, method of financing, and plan of plantations were sent to a university in a western state which is considering the possibility of establishing a botanic garden in connection with its academic and professional schools.

In the same month several colored lantern slides of views in this Garden were sent to the chairman of the Arboretum Committee of the State Federation of Garden Clubs of one of the Southern States. In acknowledging the receipt of the slides the chairman wrote: "In all my collection of views, taken in the various arboreta and botanic gardens both of this country and abroad, I find none that exceed these in attractiveness and interest."

The March, 1930, issue of the *Bulletin* of the Missouri State Board of Agriculture was a reprint (by permission) of Brooklyn Botanic Garden *Leaflets,* Series XV, No. 8–10, entitled, "Our common garden vegetables," by Dr. O. E. White, former curator of plant breeding.

In March The Regional Plan of New York and Environs was supplied with a photograph illustrating our public education work. This was for publication in the final volume of the Regional Plan series, Plan Volume II, *The Building of the City.*

In April an Agreement was entered into with the American Fern Society providing for the deposit and administration here of the Society's library, in consideration of certain mutual advantages to be derived by this plan. Dr. Benedict, resident investigator at the Garden, is editor of the *American Fern Journal,* the official

organ of the Society. The text of the Agreement is published as Appendix 8 of this Report (p. 164).

In April, also, living plant material was supplied to a museum in another city for use as a model in making a museum group.

In June, after considerable correspondence and searching of records, we were able to supply a large corporation with information concerning the naming of a red geranium. Through Mr. John Young, Secretary of the Society of American Florists, we learned that the variety was named after Col. S. A. Nutt by Mr. John Thorpe (now deceased), of Pearl River, New York.

In September, plans and enlarged photographs of our Rose Garden were sent by request for exhibit at the First National Atlantic City Flower and Garden Pageant. At this time (September 11) the American Rose Society held a meeting at which Municipal Rose Gardens were made a special feature.

In November, living plants and cuttings representing 24 different kinds were sent to a New England college for use in stocking their new greenhouse.

In December, for a similar purpose, we sent 50 plants and cuttings, in 40 varieties, to the State Hospital, Brooklyn.

## Gifts

Gifts received during the year are recorded on pages 82, 93, and 141. They have all been acknowledged with the thanks of the Governing Committee and director. Special note should be made here of a few of outstanding importance.

March 6. The Conservatory Fountain, by Mr. Alfred W. Jenkins, as already noted on page 65. Total cost, $5757.84.

February 21. A check for $1000 from the National Research Council, Washington, toward the expenses of Dr. Reed's trip to Japan to study Iris.

May 14. A new foot-bridge over the Brook, costing $1521.93, from Mr. Jenkins.

May 14. Fence and two entrance gates for the Native Wild Flower Garden. Total cost, $1610.22. Also from Mr. Jenkins.

November 12. A check for $250 from the American Iris Society toward the expenses of Dr. Reed's trip to Japan to study Iris.

Contributions of $2500 each from three anonymous friends of

the Botanic Garden, now for the fifth year in succession, for the support of the department of Plant Pathology.

## Membership

There was a decrease in the number of annual members from 648 to 627, as given on page 182 of this report. It may be noted here that membership in such an institution as the Botanic Garden is not a wholly selfish matter for, in addition to securing certain advantages for the member, it also affords an opportunity of contributing to a work of great value to the entire city, involving the employment of personnel, and which depends in large measure on private funds income for its support.

### *Plant Distribution*

At the annual distribution of surplus plants to members over 5300 plants were distributed to 305 members. These included Asters, Sedum, Boltonia, and Pansies on April 11, and Chrysanthemums on May 29.

## Sixteenth Annual Spring Inspection

The Sixteenth Annual Spring Inspection for members and friends was held as usual on the second Tuesday of May, which fell on May 13. Following the inspection of the plantations tea was served in the Laboratory Building by the Woman's Auxiliary to whom the Garden is again greatly indebted for the success of this always delightful occasion.

The exhibits on view during the serving of tea included a number of very beautiful paintings of wild flowers in their natural surroundings of fields, woods, and thickets; a number of decorative panels of cultivated flowers; and two screens with floral designs. These were by Miss Beatrice Kendall, of Manhattan, who has made a specialty of the use of flowers, shrubs, and vines in the painted decoration of rooms, employing, wherever possible, the surrounding gardens or landscape as her material, in order to achieve a unity between the house and its setting.

The new Library and Herbarium Equipment was also inspected, and several designs of Architect and Landscape Architect for additional outdoor features greatly needed and suitable for private

gifts. The weather was very favorable, and there was a large attendance.

## Appointments

### *Staff and Other Employees*

Dr. Henry Knute Svenson, Ph.D., assistant curator of plants, beginning January 2.

Margaret M. Dorward, A.B., instructor, March 17–July 15; acting assistant curator of elementary instruction, beginning July 16.

Helen D. Jenkins, A.B., instructor, beginning April 1.

Pauline S. Lehman, B.A., stenographer, beginning May 1.

Elizabeth Marcy, A.B., curatorial assistant, beginning December 15.

Frances M. Miner, A.B., instructor, beginning September 1.

## Resignations

### *Board of Trustees*

Mr. William A. Putnam. Resignation accepted December 11, 1930, to take effect May 14, 1931.

### *Staff and Other Employees*

Kathryn Clark Bartlett, A.B., instructor, September 15, 1926–December 31, 1929; acting assistant curator of elementary instruction since January 1, 1930, resigned March 31.

Elsie Twemlow Hammond, M.A., assistant curator of elementary instruction since September 1, 1921, resigned March 31.

Lucile Sargent MacColl, A.B., instructor February 1, 1929–March 31, 1930; assistant curator of elementary instruction since April 1, 1930, resigned June 30.

Elizabeth Marcy, A.B., instructor since September 1, 1928, resigned August 31.

Zelda J. Sargent, instructor since October 1, 1927, resigned April 30.

Ruth M. Tate, stenographer since October 1, 1928, resigned April 30.

## Emergency Employees

In connection with the unemployment situation the Garden has cooperated during the year with the Brooklyn Bureau of Charities

and the Emergency Employment Committee, Mr. Seward Prosser, Chairman. Beginning on March 27 and continuing until December 10, the Bureau of Charities sent us per diem men for outside work, the number varying from one to six. From December 8 until the close of the year the Emergency Work Bureau of the Prosser Committee sent us outside men, the number varying from one to seven. These men worked only three days a week. We also had from the same source two men and five women for inside positions, in the herbarium, library, seed room, and stock room, and for general stenographic work. These people worked six days a week, and most of them were to continue over into 1931.

## Organization Dinner

On Thursday evening, May 22, an organization dinner was held in the rotunda of the Laboratory Building. This dinner was the third of its kind, and marked the twentieth anniversary of the Botanic Garden, the actual work of which began with the appointment of the first and present director, effective July 1, 1910. Every monthly employee was present except three who were out of the country or out of town. Also, as guests, President and Mrs. Blum, the Chairman of the Governing Committee, Miss Loines; the Chairman of the Woman's Auxiliary, Mrs. Butler; the President of the Garden Teachers Association of the Botanic Garden, Miss Adelaide B. Harrison; the President of the Boys and Girls Club, Oswald Elbert, and wives of staff members—sixty-three persons in all. A beautifully engrossed scroll, framed, and bearing the signatures of 53 members of staff and other employees of the Garden, was presented to the Director in recognition of the completion of his twenty years of service. No man ever had from his associates a more beautiful tribute, nor one more deeply valued and appreciated. The speakers included Miss Shaw, curator of elementary instruction, who acted as master of ceremonies, President Blum, Miss Loines, Mrs. Butler, Mr. Elbert, and Mr. Free who, presented the scroll on behalf of the staff and other employees. A response was made by the Director.

This account should not be closed without recording the fact that, at its meeting on June 23, 1930, held at the Botanic Garden, the Governing Committee presented to the Director a beautiful tray with tea and coffee set of Tiffany silver, with a most gracious

expression of presentation engraved on the tray. Modesty dictates that no mention be made here of these two tributes. It is believed, however, that this statement is essential, not only for a complete history of the Brooklyn Botanic Garden, but as a public and lasting record of appreciation.

## Financial

There is probably no more irrational standard of educational values than the financial. The value of education to an individual, the value of public education to society as a whole, to a state or a municipality, can never be adequately stated in terms of dollars and cents. However, if we recall that every individual must pay for educational privileges not afforded at public expense, and that charges (at least nominal in amount) for admission to museums, botanic gardens, and zoological parks are common in other countries than this, it may not be amiss to point out what the minimum monetary value is of the educational advantages afforded the general public by the Brooklyn Botanic Garden.

Out of over 1,000,000 visitors we are, perhaps, justified in considering that, while many come merely to enjoy the Garden as they would a park or, in some cases, merely to pass through it, at least half the visitors came for the purpose of taking advantage of the opportunities for which the Garden was established, namely, to study and enjoy plant life.

On this basis, then, we may consider that in 1930 not less than 500,000 persons came to the Botanic Garden for certain educational purposes for which, had this been a private Garden, they would each have paid not less than 50 cents admission, or a total of $250,000.

The price of admission to several privately conducted gardens in America is $2.00. The price of each admission to private gardens in Pennsylvania on "Garden Days" under the auspices of the Pennsylvania School of Horticulture for Women (Ambler, Pa.) is $1.00. The admission to gardens in Westchester County for the benefit of the Westchester County Children's Association, in 1929, was 50 cents. The charge for admission to New York City museums having Pay Days is 25 cents.

If we grant further that, with a charge of 50 cents for admission, the attendance would have been reduced one half, the

FIG. 6. Potted Iris Plants (*Hanashobu*) of Mr. T. Minoda (standing at the right). From photographic negative taken in Kumomoto, Japan, expressly for Dr. George M. Reed, June, 1930. Courtesy of the Mangetsu-Kai (the Iris Society of Kumomoto).

total receipts would have been $125,000. Or, again, if we consider that it is worth at least 25 cents a visitor to the individual, the total of value received, on the basis of 500,000 visitors, is $125,000.

But the appropriation in the city Tax Budget for maintenance of the Garden in 1930 was $98,930, in return for which the Garden rendered services having a monetary value of $125,000–$250,000. The advantages of the Garden to the general public were enriched by contributions of over $100,000 of private funds. As noted previously, this monetary measure takes no account of the intangible but important educational, cultural, aesthetic, and spiritual advantages derived from the Garden, and which are really its only justification for existence.

The Financial Statement for the year 1930 may be found on pages 131–140.

## European Trip

During the summer the director spent seven weeks in Europe, sailing from New York on July 11 and returning September 16. This trip was for the purpose of visiting botanic gardens in France, Switzerland, Italy, and England, and attending the Ninth International Horticultural Congress in London, August 7–15, and the Fifth International Botanical Congress in Cambridge, August 16–23. A full account of this trip may be found in the Brooklyn Botanic Garden Record for January, 1931.

## Appended Reports

Reports on research, the administrative reports of heads of departments, and Appendices 1–8 follow as an integral part of this report.

Respectfully submitted,
C. Stuart Gager,
*Director.*

# REPORTS ON RESEARCH FOR 1930

## Plant Pathology

By George M. Reed

### *Studies on the Inheritance of Resistance of Oat Hybrids to Loose and Covered Smut*

For several years investigations have been carried on in order to determine the mode of inheritance of smut resistance in oat hybrids. A large amount of data has been obtained with second generation plants of several different crosses and, in some cases, the experiments have been continued through the third and fourth generations. During the past year, additional data have been secured with a number of hybrids, representing different combinations of smut resistance.

In our last report we recorded some data on hybrids between Early Gothland and Monarch. The former is very susceptible to the loose smut, but resistant to the covered, while the Monarch variety shows exactly the reverse behavior with reference to the smuts. 50 second generation plants were inoculated with the loose smut, and 9 (18.0 per cent.) were infected. In another series, 85 second generation plants were inoculated with the covered smut, and 9 (10.5 per cent.) were infected. During the past year, several third generation progenies were grown, some individuals of which were inoculated with the loose smut and other individuals with the covered smut. The most significant results, perhaps, are that certain progenies were found to be entirely resistant to both loose and covered smut, while other progenies were more or less susceptible to one smut and resistant to the other. The results indicate that the factors determining resistance to the two smuts in these hybrids are independent of each other. The facts are particularly significant in connection with the data already obtained in such crosses as Hull-less × Black Mesdag, in which the resistance to the two smuts appears to run entirely parallel.

The fourth generation progenies of several of our earlier crosses were also grown, with a view to clearing up some of the problems involved. A large amount of data has been obtained and, in the main, the results are in harmony with those previously secured.

Most of the studies during the past year, however, were con-

cerned with obtaining additional data on second generation plants of a large number of different hybrids involving various combinations of smut resistance. At least five different groups of hybrids were grown.

1. In the first group, one variety resistant to both loose and covered smut was crossed with another variety which is susceptible to both smuts. Three different hybrids involving this type of combination were made. In every case, Markton was the resistant variety, being crossed with the susceptible varieties Canadian, Early Champion and Victor. These latter varieties usually give 100 per cent. infection with both loose and covered smut, while Markton quite regularly gives negative results, although occasionally an infected plant may be observed.

2. A second group of hybrids involves the combination in which one parent is resistant to both smuts, while the other parent is susceptible to the loose, but resistant to the covered. The second generation plants of a hybrid between Early Gothland and Markton were studied.

3. The third type of cross was concerned with the case where one parent is resistant to both smuts, while the other is susceptible to the covered, but resistant to the loose. This is the reciprocal of the preceding type of cross. Again, Markton was used as the resistant variety, while Monarch was the other parent.

4. The fourth type of hybrids involves a parent susceptible to both smuts, while the other one is susceptible to the loose smut, but resistant to the covered. Two hybrids of this type were studied, one between Orientalis and Victor, and the other between Scottish Chief and Victor. The Victor variety is entirely susceptible to both smuts, while Orientalis and Scottish Chief are susceptible to loose smut, but resistant to the covered.

5. The final group of hybrids includes crosses between one variety susceptible to loose smut, while the other is susceptible to the covered. The second generation progenies of six different combinations of this type were studied. In every case, Monarch, a variety highly susceptible to the covered smut, and extremely resistant to the loose smut, was crossed with the following varieties: Early Gothland, Rossman, Danish, Danish Island, Orientalis, and Scottish Chief. The last named varieties show extreme suscep-

tibility to the loose smut, combined with high resistance to the covered.

The progenies of 52 different crosses were grown. The general procedure in each case was to inoculate one set of second generation plants with the loose smut, and the other with the covered. A very large amount of valuable data bearing upon the general problem of the inheritance of the smut-resistant quality has been obtained. It is planned, during the coming season, to grow as many as possible of the third generation progenies of these various hybrids in order to determine quite fully the mode of inheritance of the resistant quality.

Some of our studies on the general problem of oat smut investigations are in cooperation with Mr. T. R. Stanton, Senior Agronomist of the Office of Cereal Crops and Diseases at Washington, D. C. Mr. Stanton has furnished some of the material for the study of the hybrids, and is also testing out, from the agronomic standpoint, some of the lines which are promising on account of their smut resistance.

### *Additional Physiologic Races of Oat Smuts*

The problem of the specialization of both the loose and covered smut of oats has continued to receive attention. A number of collections of both smuts have been received from Mr. T. R. Stanton, and these have been used to inoculate several varieties of oats. A number of new races have been isolated. These are particularly important from the standpoint of breeding oats for smut resistance.

### *Influence of Environal Conditions on Oat Smut Infection*

Some experiments have been carried out with reference to external factors influencing oat smut infection. Usually, with a susceptible variety, by the proper combination of conditions, we are able to secure the infection of all the inoculated plants. The most favorable combination of factors has previously been worked out. During the past year, however, experiments were conducted to determine whether the growth of the host plant would influence the subsequent development of the parasite. All the plants were subjected to the same conditions during the seedling stage in order

that penetration of the parasite might be secured. Then, during the further growth of the plants, various modifications in the nutrition were made. As a result, some of the plants were small, and dwarf, as compared with the vigorous tall, branching, ones in the experiment. All of the cultures, however, showed practically the same percentage of infected individuals. In other words, the most effective factors influencing the appearance of smut in the plant are those involved in the very early seedling stages when infection occurs. After the smut fungus once gains entrance into the plant, the subsequent rate and amount of growth of the latter does not appear to prevent the final development of the parasite in the flowers.

*Sorghum Smut Investigations*

Studies were continued in connection with the covered kernel smut of sorghum. Many second generation progenies of different crosses of sorghum varieties were inoculated and grown to maturity. The hybrids involved various combinations of resistant and susceptible varieties.

During the past year, a paper on " A new method of producing and detecting sorghum hybrids " was published and, in this paper, some of the data on the inheritance of smut resistance were recorded.

The method is based on the fact that the seedlings of sorghum hybrids differ in color, some being green, while others are red or reddish purple. It is further observed that among the hybrids of green seedling and red seedling varieties, the red character is dominant. These two observations suggested a method of obtaining and detecting hybrids between certain varieties with comparative ease.

The procedure was to use the green seedling variety as the female parent. The young flowers of such a plant were pollinated with the pollen from a red seedling variety, the operation being repeated at intervals as long as the flowers continued to open on the green seedling parent.

It was expected that most of the flowers on the female plant would actually be selfed, due to the relative abundance of pollen from other flowers on the same head. It was assumed, however, that the foreign pollen of the red seedling variety would reach the

stigmas of at least a few of the flowers at the right time to bring about cross-pollination.

In order to determine whether cross-pollination had occurred, the seed from the female parent was collected and later germinated in sand under favorable conditions. If cross-pollination occurred, leading to the production of hybrids, it was expected that two types of seedlings from seed of the same head would be obtained, most of them being green, having developed from self-pollinated flowers, this being the characteristic color of the female plant. A few seedlings, however, due to the presence of the foreign pollen, would be red, and consequently hybrids.

The method proved entirely successful and, with comparative ease, we were able to obtain a large number of hybrids between different varieties. The obvious limitation of the method, of course, is that the green seedling variety must in every case be used as the female parent.

### *Beardless Iris Project*

The Iris season of 1930 was spent in Japan, an account of which has been published in the Brooklyn Botanic Garden RECORD, 19: 257–268, November, 1930. During our stay, we were able to visit a great many gardens where the Japanese Iris were grown. Valuable information regarding the culture of the Iris, the varieties grown, and the history of the Iris, was obtained. We also secured numerous photographs of different gardens, and made arrangements for the importation of special varieties. We have also arranged for the collection and forwarding of seed of the wild Iris from a number of different places in Japan.

In our own collection, many of the varieties bloomed satisfactorily. Practically all of them, however, had been transplanted in the fall of 1929, and the best bloom is not likely to be obtained in the following year. The plants, however, came through the more or less adverse season of 1929 in fairly good shape.

A few additions to the collection have been made: Two varieties of Japanese Iris were received from Prof. Frank T. McFarland, Lexington, Ky. Mrs. Wheeler H. Peckham, New Rochelle, N. Y., sent us twelve species of Beardless Iris from the collection at the New York Botanical Garden, which, for the most part, have been recently described by Dr. John K. Small. Dr. Charles F.

Saunders, Pasadena, Cal., sent us plants of *Iris unguicularis*. Nine different species or varieties of wild Iris were collected in California and other places. Three species were purchased from C. G. Van Tubergen, Ltd., Holland.

## Forest Pathology

By Arthur Harmount Graves

### *Breeding Work With the Chestnut*

As usual, the research work with the chestnut has been carried on in collaboration with the Office of Investigations in Forest Pathology, Bureau of Plant Industry, U. S. D. A. As an example of the close interconnection of the various branches of plant science, this year the heading for this report might just as well be "Forest Genetics" since nearly all of the work has consisted of breeding together the Japanese and American chestnuts. However, the original source of all the evil, the cause of the tremendous losses we are trying to remedy, is the parasitic fungus, *Endothia parasitica*, and it is on account of such organisms that the science called plant pathology has come into being.

It is well known that the Japanese chestnut, *Castanea crenata*, is usually a low, round-headed tree, and this statement applies also to the hairy Chinese chestnut, *C. mollissima*, while the native American species is characterized by a straight, tall trunk, at least when growing in the forest. As regards susceptibility to the bark disease, the Japanese tree shows marked resistance amounting in many cases to near-immunity. On the other hand, the American species is extremely susceptible to the disease, and it is this vulnerability that has resulted in the almost total disappearance of the chestnut as a forest tree from our American woodlands. We say "almost total": there are some counties in West Virginia, Tennessee, North Carolina, and Georgia, where a small percentage of trees is still uninfected [1] with the bark disease. The tremendous economic value of the American chestnut and the irreparable loss which its passing means to the American people have been set forth in my report of 1929.

[1] Gravatt, G. F. and Gill, L. S. Chestnut blight. U. S. Dept. Agr. Farmers' Bull. 1641. November, 1930.

FIG. 7. Imaginary landscape, showing ancestral forms (reconstructed) of the modern horsetails (*Equisetum*). This is one of eight transparencies to be installed in the Conservatories. (7015.)

*The Problem Stated.*—It is clear from what has been said that from the standpoint of forestry the oriental chestnuts (considered as a whole) and the American chestnut have each a strong point and a weak point. The oriental trees are typically low and round-headed and hence not good for timber, but they resist the attacks of the parasitic fungus. The American chestnut, on the other hand, is a tall forest tree, but offers little or no resistance to the fungus. The problem is, therefore, to combine the strong points in these trees by breeding them together in the hope of eventually producing a race which is both disease resistant as well as possessing the dimensions and habit of a forest tree.

*Progress in 1930.*—I shall describe our work in some detail both because it may be of some interest to members of the Garden and also because from the outline of the methods here presented they may be able to carry on experiments of their own and thus increase the chances of obtaining the desired result in this region.

Many of the sprouts from the stumps of diseased chestnuts are producing pollen, but the flowering period, that is, the season when the pollen is ripe and being shed, occurs (in this neighborhood) usually from about July 1–12, a period which is somewhat later than the flowering time of the orientals, or at least of some of them. Therefore it is impossible to secure pollen from native stock sufficiently early to carry on thorough crossing experiments with many of the orientals, although there are a few late flowering ones with which this can be done. With the cooperation of the office of Forest Pathology, U. S. D. A., we were able to secure ample supplies of American pollen from Washington, D. C. and from Ohio, where the flowering period is some days earlier than in the New York region. Three Japanese chestnuts were used for crossing experiments, as follows—all on Long Island:

1. At Old Westbury, on the estate of Mr. Beekman Winthrop.
2. At Syosset, on the estate of Mr. Bronson Winthrop.
3. At Oyster Bay, on the estate of Mr. Renville S. Smith.

These trees have all been described in detail in my report for 1929. (Brooklyn Botanic Garden Record, **19**: 64–67, 1930.) The owner, in each case, kindly gave his permission for us to use his tree.

The first step was the bagging of the young flowers of these Japanese trees, which was done on June 23d, several days before

any pollen was shed. The young stamens were removed and the balance of the catkin, bearing its young pistils, was enclosed in a paper bag tied to the twig with copper wire. This step was necessary to prevent any of the pollen of the tree itself from reaching its own stigmas. For this and the succeeding operations it is a pleasure to acknowledge the valuable assistance of Miss Rusk, who has had considerable experience in this kind of work. The first pollination with American pollen received from Washington was carried out on June 28th. The bags were removed and the young pistils gently rubbed with the dehiscing anthers from the catkins, in order that some of the pollen might fall on the stigmas. One, or a part of one, of the catkins was tied near the pistils and the whole re-covered with the paper bag. Altogether, about 75 pistils (or rather, pistil *groups*, since each involucre surrounds a cluster of pistils) were pollinated in this way.

A second pollination was made on July 1, using the same pollen from Washington, which germination tests in the laboratory showed to be still viable. However, for the Oyster Bay tree, pollen from a native shoot of chestnut then in flower near by was used.

A third pollination was made on July 7. This time fresh pollen was used from Ohio, sent by the U. S. D. A., as well as pollen I myself obtained from native shoots in central New Jersey. At each pollination great care was taken to prevent pollen from the tree itself reaching the stigmas. On this account we used an umbrella, holding it closely over the bag during the operation, for during these summer days the air surrounding these chestnuts is plentifully charged with the pollen grains from the millions of dehiscing anthers.[2] In one case, namely on the Oyster Bay tree, the third pollination, July 7, was omitted, because the air was so full of the Japanese pollen.

The bags were left on as long as any of the flowers on the tree appeared to be shedding pollen. Several visits of inspection were made, and finally, on July 30, all of the stamens being evidently withered and brown, the bags were removed. Although only grocers' ordinary paper bags had been used, they had kept intact

[2] This was absolutely necessary in the case of the Syosset tree, which has two leaders, each a different variety, one of them, at least, being grafted. It is interesting to note that this tree always bears heavy crops of nuts on both leaders.

through wind and rain. Also it was noticed that leaves, some of which had gotten enclosed in the bags, were still healthy and green. However, many of the pistils had fallen off inside the bags, either because the pollination had been unsuccessful or because they had been knocked off by the wind, or from both causes. Less than half of the pollinated pistil groups remained. For example, only five bags of the seventeen on the tree at Syosset contained growing nuts.

The chestnut is reputed to be self sterile. If this were true it would not have been necessary to bag these trees at all after crossing with the American chestnut pollen; one might rely on the sterility of the tree's own pollen. However, exceptions occur. Self fertilized trees are known to have developed a few nuts in some cases; and further, pollen from other somewhat distant trees might be brought by air currents.

On September 18 two nuts were collected from one of the burrs on the Old Westbury tree. Only one other burr had developed to full size and this, being still unopened, was bagged to prevent possible loss of the fruit. On the basis of what I have said above about the self sterility of the chestnut, it is significant that those were the only burrs which developed on the Westbury tree. It would seem as if there were no question here but that a cross of the American and the Japanese species has been effected.

On October 7 two burrs were collected from the Syosset tree yielding one nut apiece, and on October 14 three burrs from the Oyster Bay tree, yielding one, two, and two nuts respectively.

These nuts (ten in all) have been kept all winter in the cool propagating house of the Conservatories, in sand and damp sphagnum moss, and are apparently in sound condition. They will be planted in pots about February 1.

It should be stated that in addition to the work described above, sixty seedlings of the forest type of Japanese chestnut were set out on land belonging to the writer at Hamden, Connecticut. These Japanese chestnuts, although not growing so tall and straight as the American species, give promise of furnishing timber for small telephone poles, fence posts, and wood for tannin extract, as well as furnishing desirable stock for crossing with the American chestnut. Besides this, about three acres have been cleared and plowed to prepare them for future plantings of exotic and hybrid chestnuts.

## Systematic Botany, 1

By Alfred Gundersen

### *Frankenias*

I have in preparation a study of American *Frankeniaceæ,* but am very short of specimens from Mexico and Argentina. In the principal herbaria of this country and Europe I found only one collection from Mexico outside of Lower California, and from Argentina for *Frankenia* proper very few collections.

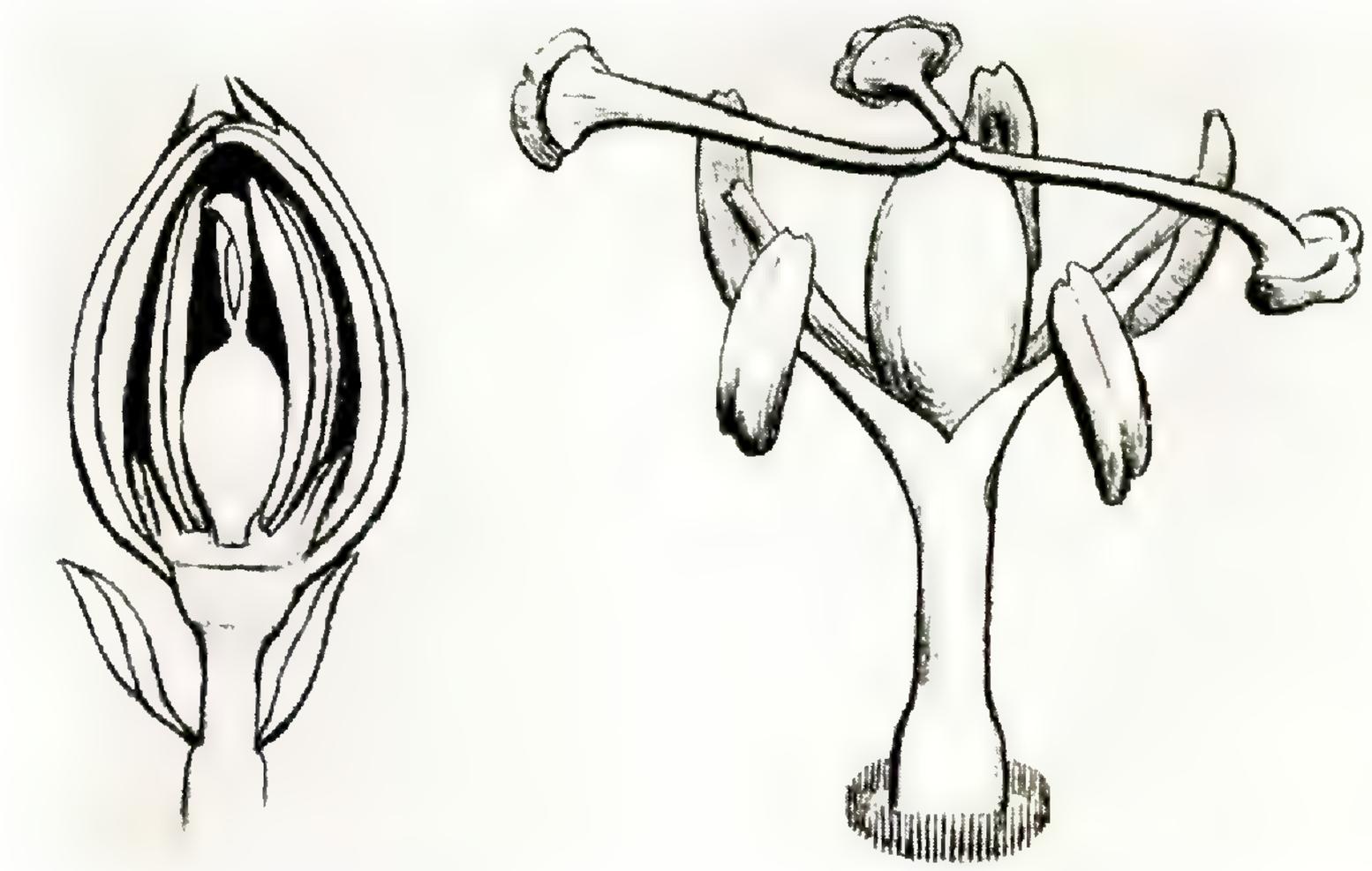

Fig. 8. Passion Flower (*Passiflora alata-caerulea*). Longitudinal section of bud, and (at the right) the essential organs raised on the stalk (androgynophore). Explanation in the text. (7026.)

### *Floral Structures*

I continued the study of flower structures of which Miss Purdy made drawings, also of the distribution among various families of dioctyledons. I presented a brief paper on the "Sequence of Genera Within the Family," relating to *Passifloraceae, Cactaceae* and *Amaryllidaceae* at the Cleveland meeting of the Botanical Society of America.

The accompanying illustration (Fig. 9) shows the bud and central parts of a flower of *Passiflora alato-coerulea* from our conservatories. The passion flowers are characterized by having stamens and pistils raised on an *androgynophore*. But in the bud the parts are practically on the receptacle, the same as in *Mitostemma* and other members of the family. The development of the flower of *Passiflora* is therefore suggestive of the direction of evolution of the family.

Similarly in *Glaucium flavum* (Fig. 9) from our outdoor collections. The poppy family is characterized by a rather broad stigma. But in the bud we see a form of stigma more like the buttercup family.

Again, in the flower of *Narcissus Pseudo-Narcissus,* the crown is equal in length to the free perianth-segments, in the bud it is less than half as long, more like *Narcissus poeticus,* suggesting a direction of evolution different from that adopted in standard works. Other studies have been made of the flowers of *Cactaceae* and *Aizoaceae*.

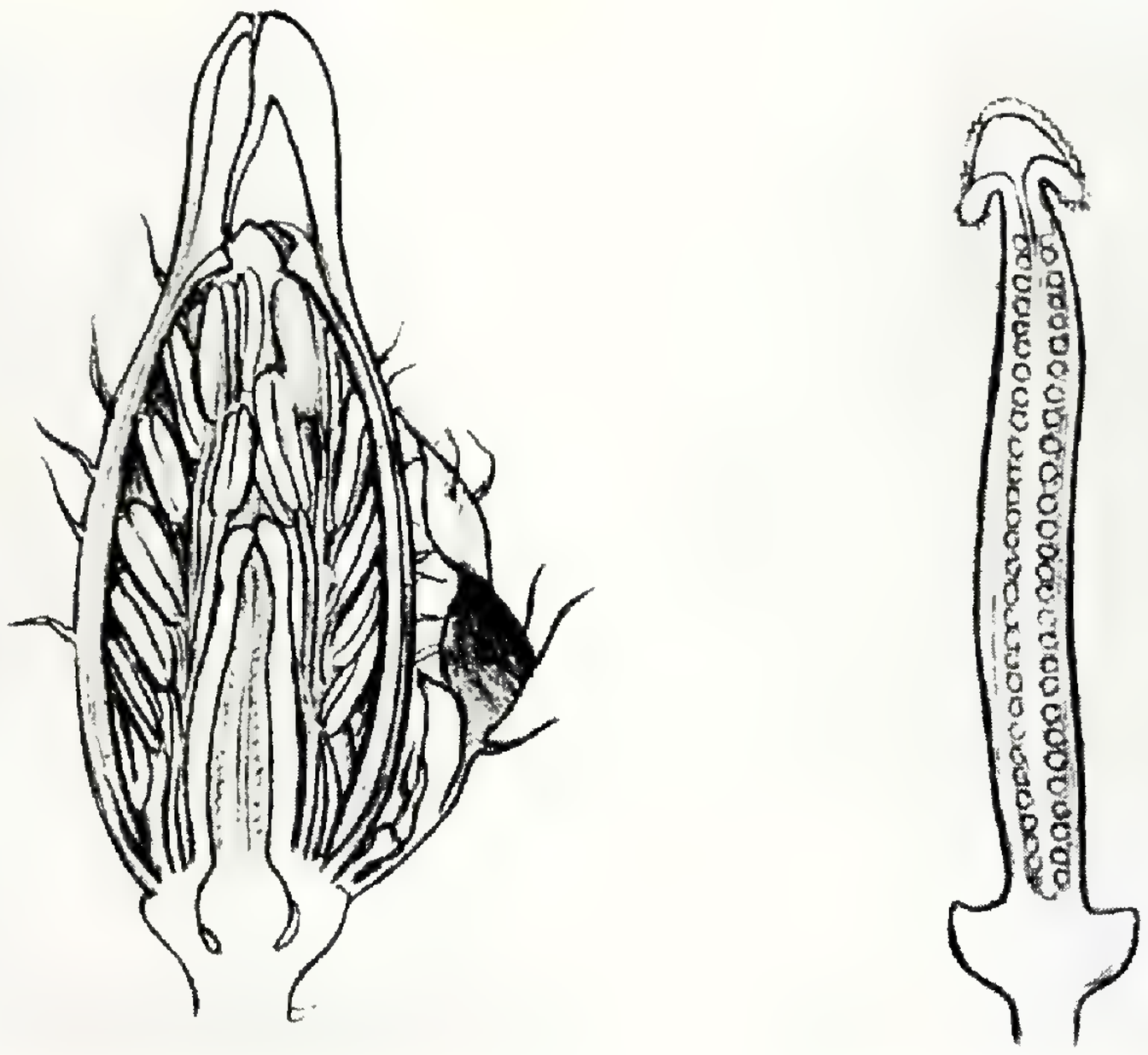

FIG. 9. Horned Poppy (*Glaucium flavum*). Longitudinal section of bud showing Buttercup-like stigma in the bud, and (at the right) the mature broad stigma characteristic of the Poppy Family. Fuller explanation in the text. (7021.)

*List of Families and Genera as to which Usage Differs*

This list published as *International Seed Exchange Communication No. 11* has taken a great deal of my time for more than a year. It includes the nomenclatural and taxonomic differences between the *Index Kewensis* and De Dalla Torre and Harms' *Genera Siphonogamarum* for Angiosperms, excluding only the two large families *Compositae* and *Orchidaceae;* it also aims to include under "Addita" all recent generic names and others which are not in the work of De Dalla Torre and Harms. The number of such names proposed or revived since the Vienna Congress, is nearly 2,500.

With unity as to rules of nomenclature attained in the Cambridge Congress it may be expected that the numerous nomenclatural differences will be gradually eliminated. While taxonomic differences are considered outside the scope of an international botanical congress, practical requirements in this direction may be in large part met by the decision of the London Horticultural Congress to prepare an International List of Horticultural Species.

## Systematic Botany, 2

By H. K. Svenson

During the past year, my first with the Brooklyn Botanic Garden, I accompanied the Astor Expedition to the Galapagos and Cocos Islands as field botanist. In order to gain a conception of the extraordinary vegetation of these islands I spent a week at the Gray Herbarium at Cambridge, where undoubtedly the richest collection of Galapagos material is located. My brief stay in the Galapagos Islands was sufficient for me to realize that much work remains to be done on the relationships of the flora of the individual islands, relationships especially important from the evolutionary point of view. I hope that I may again visit them.

I have been identifying the specimens of this collection with the help of several specialists, notably, Mr. Paul C. Standley of the Field Museum who has named the *Rubiaceae;* Dr. H. A. Gleason of the New York Botanical Garden who has worked out the *Melastomaceae;* Dr. L. B. Smith of the Gray Herbarium, the *Bromeliaceae;* Mr. C. A. Weatherby of the Gray Herbarium, the

ferns; and Mr. Charles Schweinfurth of the Ames Botanical Laboratory, the *Orchidaceae*. It is anticipated that a detailed account will be published some time during 1931.

The plants collected by me in Tennessee and Kentucky during the past summer are being studied. Some progress has also been made on the monographic study of the genus *Eleocharis*, a group of sedges, a second portion of which is now ready for publication. In the study of this genus I have borrowed material during the past year from Mr. C. C. Deam, the University of Illinois, the Gray Herbarium, the University of Tennessee, and the University of Texas.

For some years I have been studying the genus *Bidens* (Beggar's Ticks) as it occurs along the Hudson River, from the point of view of variation in species. I have accumulated a large amount of material, both from wild specimens and plants grown under glass, and intend to continue the problem during the summer.

## Genetics

### *Studies on the Variation of Nephrolepis (Boston Ferns, etc.)*

By Ralph C. Benedict

The collections of *Nephrolepis* have been continued, including necessary attention to the propagation of the types shown in the public collection and those still under observation in the experimental house. Observations and records have been continued on several forms not yet reported. It is hoped that studies may soon be made of the effect of penetrating rays (X-rays and Radium rays) on vegetative mutation in these ferns.

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## REPORT OF THE CURATOR OF PLANTS FOR 1930

Dr. C. Stuart Gager, Director.

*Sir:* I submit herewith my annual report for 1930. Since the coming of Dr. Svenson in January my work has been greatly simplified by his taking charge of the herbaceous beds, the local flora section, and the herbarium of American plants, leaving in my charge woody plants and the herbarium of old-world plants. Dr. Svenson, assistant curator, reports as follows:

## The Herbarium

"Shortly after my arrival in January the new herbarium cases were installed; this naturally required some re-arrangement of the herbarium material, and a reorganization of unmounted plants in storage. As a result all of our herbarium collections are now stored in fireproof cases. By good fortune we had the service of Mrs. Putz, a former worker in the Garden; thus we have during the past year been enabled to get several collections mounted, including Mrs. Mexia's Alaskan plants, given to us by Mrs. Adrian Van Sinderen, and a large part of a set of Pringle's plants of Mexico. A vast amount of material is still unavailable for use, due to the fact that it is unmounted. During the past winter Miss Burr has gone over the mosses, in order to combine the various collections and to remove duplicates.

"We are now engaged in the reorganization and sorting out of duplicates of the extensive collection of specimens of woody plants made by Dr. C. K. Schneider at the Arnold Arboretum in 1916 and 1917.

"During the past year herbarium material has come on an exchange basis from the University of California and the United States National Museum. There has also been received as a gift from Mr. Vincent Astor the specimens of plants collected by the Nourmahal Expedition to the Galapagos Islands, of which I was the botanist.

"In addition to some local specimens collected by Miss Rusk and myself, the herbarium has received a collection of plants made by me during the month of August in Tennessee and Kentucky. The total number of plants in my two collections (duplicates included) is approximately 5,000.

"In addition to routine identification of miscellaneous material, the writer has determined *Cyperaceae,* chiefly *Eleocharis,* for several institutions.

## Classes and Lectures

"During the spring of 1930, with Miss Rusk's assistance, a course was given for eight afternoons on the spring vegetation of the New York region, and in the fall a similar series of four afternoon classes was held. In addition I gave a course of four

lectures on the geography of plants of Eastern North America; two lectures were also given on the flora of the Galapagos and Cocos Islands, one on the evolution of plants, and one for Boy Scout Leaders on berries and fruits.

"On the grounds the work during the past year consisted to a large extent of checking the identity of plants in the systematic herbaceous beds. A revival of the Native Wild Flower Section, which for several years has been neglected, has progressed to the extent of construction of a shallow sandy pond, simulating a pine-barren pond, removal of sand from the old bog, planting of a large number of trees and shrubs (chiefly oaks, maples, and viburnums), and the clearing out of a large number of foreign shrubs. A limestone ledge for calciphile plants of our area and a small brook are included in the ultimate project for development of this Section. The surrounding fence gives the Section greater seclusion, by preventing indiscriminate entrance and thus allows the accumulation of leaf mold in the wooded area.

"Preliminary accounts of the Galapagos Expedition have been published in the *Bulletin* of the New York Zoological Society, for July–August, and in the Brooklyn Botanic Garden RECORD for November."

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## Woody Plants

During the spring the collections of trees and shrubs of the systematic section were re-mapped, a much needed work. In the new maps we can see just what room is available in any area, circles of various sizes representing the plants. We have many rare, semi-hardy woody plants north of the nursery, which need protection.

## Iris Plantations

Dr. Reed reports that a few additions were made to the collection of Bearded Iris on the basis of exchange. Through Mrs. Wheeler H. Peckham, we received eighteen varieties from the Iris Test Garden of the American Iris Society located at the New York Botanical Garden. Seven unnamed varieties were received from Mr. W. C. Hutton, New Haven, Conn. Miss Bessie Matthews of Brooklyn presented a clump of a seedling tall Bearded Iris which she raised, and has named Dr. George H. Smith.

## Conservatories

Following out plans for the improvement of the conservatory collections, in the direction of gradually substituting definitely planned groups for miscellaneous groups, house plants and insectivorous plants were installed in House No. 4, and in December nine glass aquarium tanks were obtained for water plants. Houses 11 and 12 were also rearranged, to include citrus and other subtropical fruits, Japanese dwarf plants, and other groups.

*Transparencies.*—Additional drawings for transparencies representing fossil plants were made by Miss Purdy, eight being nearly ready at the end of the year. In this connection I corresponded with paleobotanists and visited Dr. Berry at the Johns Hopkins University, Dr. Hollick at the New York Botanical Garden and Dr. Wieland at Yale, all of whom gave valuable suggestions.

## Herbarium

Thanks to the energy of Miss Burr and later of Dr. Svenson, the former chaotic state of our storage collections downstairs has been largely overcome.

Among collections acquired during 1930 were the following: 400 specimens from the Galapagos Islands and 204 chiefly from Tennessee, collected by Dr. Svenson; 225 from Honduras, purchased from W. A. Schipp; 125 obtained by exchange from the University of California; 523 Philippine plants purchased from Mr. A. D. E. Elmer; 272 from the state of Washington, purchased from Mr. J. M. Grant.

The old-world herbarium has been separated from that of American plants.

## Cryptogamic Herbarium

Algae, lichens, and bryophytes have now been provisionally arranged in the new cases in the basement. Some duplicates of mosses have been sorted out.

Dr. Reed reports that very few additions were made to the Herbarium of Fungi during the past year: 26 specimens of higher fungi were received from the University of California, on the basis of exchange; three additional fascicles of the Fungi Exotici, published by Dr. H. Sydow, and containing 150 specimens, were purchased.

## Lectures and Classes

Following lectures by Dr. Graves and Dr. Svenson, I gave two lectures at the Garden in March, "Mesozoic Life: Gymnosperms and Reptiles," and "Cenozoic Life: Angiosperms and Mammals." Assisted by Miss Hester M. Rusk, I gave a course of eight lessons in the Botanic Garden on "Plant Families."

## Seed Exchange

Seeds were collected in the southern mountains by Dr. H. K. Svenson and by Mr. A. J. Sharp; seeds of Venus' Fly Trap were collected by Miss C. Harrell in North Carolina.

## European Travel

As reported in the January 1931 RECORD, I attended the London Horticultural Congress and the Cambridge Botanical Congress and later visited Scandinavia and Russia, during August, September and October.

## Illustrations of Flowering Plants

With a view chiefly to use for outdoor study and notes, 300 copies of a book were printed in December containing 200 plates of flowering plants, illustrating about 1500 species. These are from Dr. G. T. Stevens' work, printed in 1910, used by permission of his son Dr. Charles W. Stevens of New York City.

## Labels and Signs

Labels and signs were made by our labeler, Mr. John McCallum, as follows:

| | |
|---|---|
| Steel labels for herbaceous beds | 337 |
| Steel family labels for beds | 138 |
| Lead labels for woody plants | 194 |
| Lead labels for rock garden | 143 |
| Small wooden labels | 280 |
| Wooden signs | 132 |
| Cardboard signs | 154 |
| Large wooden labels | 65 |
| Total | 1,443 |

Also numerous miscellaneous numbers and signs.

## Statistics

| | Plants | Species or Varieties |
|---|---|---|
| *Living Plants Received:* | | |
| By exchange | 282 | 161 |
| By gift | 601 | 195 |
| By purchase | 6,041 | 308 |
| Derived from seed | 105 | 105 |
| By collection | 106 | 31 |
| Total | 7,135 | 800 |
| *Living Plants Distributed:* | | |
| To members | 5,311 | |
| By exchange | 339 | |
| Total | 5,650 | |
| *Seed Packets Distributed:* | | |
| By exchange | 2,397 | |
| *Seed Packets Received:* | | |
| By exchange | 1,053 | |
| By gift | 33 | |
| By purchase | 50 | |
| By collection | 3 | |
| Total | 1,139 | |
| *Herbarium Specimens Received:* | | |
| By exchange | 175 | |
| By gift | 114 | |
| By purchase | 1,120 | |
| By collection | 1,042 | |
| Total | 2,451 | |

Respectfully submitted,

ALFRED GUNDERSEN,
*Curator of Plants.*

# REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1930

DR. C. STUART GAGER, DIRECTOR.

*Sir:* I take pleasure in submitting herewith my report for the year ending December 31, 1930.

## Garden Attendance

The registration figures at the seven entrance gates totalled a somewhat lower figure than last year (Table III). The figures were lower than those of last year for every month with the exceptions of April—110,147 as against 97,612 of April 1929, and November, 53,743 as against 53,254 of last year. However, the falling off may not be as great as appears on the surface; in fact the total number of adult visitors and of children accompanied by responsible adults may be in reality as great or even greater than that of last year. For early in 1930 guards were stationed at all the entrance gates with instructions not to admit young children unaccompanied by responsible adults. This action had become imperative on account of the continued vandalism of groups of young children (chiefly boys) who ranged up and down the plantations trampling on the plants, throwing various objects at the fish in the lily pools and otherwise disturbing them; catching, or trying to catch the frogs in the Japanese Garden lake, etc.; and behaving themselves in general as if the Garden were an area of wild land for exploitation or collection rather than a valuable assemblage of living plants for exhibition purposes. Repeated warnings and scoldings had been of no avail, and it was physically impossible for the one or two policemen detailed to Garden service to cover the whole territory at once. Hence the installation of guards at the entrance gates. It is interesting to note that the number of visitors to the conservatories increased from 32,880 in 1929 to 40,093 in 1930. This in itself is a strong indication that the number of genuinely interested visitors to the Garden really increased last year.

## TABLE III

### Attendance at Garden During 1930

| | Jan. | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|
| At regular classes | 1,300 | 2,255 | 3,743 | 3,461 | 3,582 | 2,678 | 12,150 |
| At visiting classes | 7,741 | 860 | 6,087 | 7,581 | 8,163 | 2,135 | 100 |
| At lectures to children | 7,700 | 560 | 3,149 | 6,521 | 5.763 | 2,020 | 50 |
| At lectures to adults | 0 | 0 | 0 | 175 | 416 | 100 | 0 |
| At conservatories | 1,669 | 3,034 | 3,173 | 5,700 | 5,177 | 4,030 | 2,576 |
| At grounds | 40,453 | 58,986 | 77,945 | 110,147 | 150,433 | 113,155 | 101,727 |

| | Aug. | Sept. | Oct. | Nov. | Dec. | Annual Totals |
|---|---|---|---|---|---|---|
| At regular classes | 11,250 | 3,428 | 5,874 | 3,645 | 2,897 | 56,263 |
| At visiting classes | 0 | 105 | 4,871 | 4,107 | 3,020 | 44,770 |
| At lectures to children | 0 | 95 | 2,500 | 2,746 | 2,060 | 33,164 |
| At lectures to adults | 0 | 0 | 230 | 90 | 180 | 1,191 |
| At conservatories | 2,336 | 3,383 | 4,000 | 2,864 | 2,151 | 40,093 |
| At grounds | 76,350 | 106,064 | 82,949 | 55,743 | 32,075 | 1,006.027 |

## Attendance at Garden Classes and Lectures

These figures are interesting since they show marked fluctuations from year to year, but in general it is evident that there is a considerable sustained increase. The figures include attendance at regular Garden classes, of visiting classes, and at public lectures at the Garden delivered to children and adults.

| | |
|---|---|
| Year 1926 | 87,766 |
| " 1927 | 97,884 |
| " 1928 | 151,631 |
| " 1929 | 110,649 |
| " 1930 | 135,088 |

## School Service

It is a pleasure to record that during 1930 every High School in Greater New York, with a single exception, was assisted by study or loan material from this department at the Brooklyn Botanic Garden. In addition, three training schools for teachers, nine colleges and universities, eleven private and parochial schools, and thirteen other institutions were served. Fresh plant material

FIG. 10. Riker Mount showing various forms of leaves. An example of material prepared by the Garden for loan to the schools. (6993.)

illustrative of various plant groups and plant organs was furnished. A list of the kinds of material which are ordinarily sent out was given in my report for 1929. A new loan collection of lantern slides entitled "Conservation of native plants," accompanied by a typewritten text, was prepared and added to our series. The number of petri dishes filled with sterile agar continues to increase, 5,226 dishes being sent to the schools. The figures for the distribution in former years are given in my report for 1929. As usual, Miss Rusk, who has been assisted by Miss Vilkomerson, has had entire charge of this part of the work which deals with high schools, colleges and universities, and institutions of similar rank.

### Adult Classes, New Courses, etc.

In the new course entitled "The Story of Plant and Animal Evolution," a series of four lectures given in March, I delivered the first lecture, entitled "Water Plants and Water Animals," Dr. Svenson the second, "From Water to Land," and Dr. Gundersen the last two: "Early Land Life" and "Modern Land Life." Dr. Svenson and Miss Rusk took charge of the field course, "Spring Flowers and Ferns of the New York Region," which had been conducted in the past by Dr. Gundersen and Miss Rusk. In the spring, also, Dr. Svenson gave a new course of six exercises in "Plant Geography." Classes of student nurses from Prospect Heights Hospital and from Kings County Hospital came here for ten exercises in the spring and ten in the fall under my direction. The total registration for these classes (four in all) was 92. As usual, the medicinal plants growing in the plantations of the Garden were studied, and this field work was followed at each exercise by informal lectures in the laboratory, at which the structure and functions of plants and animals were compared. In the fall the course in General Botany (B1) for teachers was again offered, and Miss Rusk was given entire charge. The registration, 27, was the largest (with the exception of the year 1927, when there was a class of 30) that we have ever had for this rather technical course. Our plan was to offer this course in alternate years, but it is so difficult to present the subject matter of general botany satisfactorily in 30 exercises that it may be advisable to lengthen it into a two year course.

In general, I feel that, considering our very small staff, adult instruction is going forward satisfactorily. Although the total adult registration last year was 485 as against the high point of 513 reached in 1929, this is in reality only a slight difference. In point of variety of courses offered there was a distinct improvement over former years.

## Flower Days

The custom initiated four years ago of setting apart festal days for particular flowers, and holding appropriate exercises thereon, has proved so popular with the members of the Garden that these occasions must now be looked upon as regular fixtures of the Garden calendar. Members have expressed the opinion that they combine many desirable features: namely, the opportunity of viewing the floral displays when they are in their prime, and of inspecting them under expert guidance; incidentally of renewing acquaintance with the Garden; of listening to talks by well known connoisseurs on the culture, history, new varieties, etc., of the flowers concerned; and finally, of meeting together in an informal way over a cup of tea.

Last year seven Days were thus celebrated, as follows:

Friday, March 28. Crocus Day.
Leader: Miss Hilda Loines, F.R.H.S., Chairman of the Brooklyn Botanic Garden Governing Committee.

Friday, April 11. Daffodil Day.
Leader: Mrs. Wheeler H. Peckham, Honorary Curator of Iris and Narcissus Collections, New York Botanical Garden.

Monday, May 19. Rock Garden Day.
Leader: Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden.

Monday, May 26. Iris Day.
Leader: Mr. R. S. Sturtevant, Director of the Lowthorpe School of Landscape Architecture for Women, and Editor of the Bulletin of the American Iris Society.

Friday, June 13. June Rose Garden Day.
Leader: Mr. John D. Arentshorst,* of Bobbink and Atkins, Rutherford, New Jersey.

Friday, October 10. Fall Rose Garden Day.
Leader: Mr. G. A. Stevens, Assistant Editor of Publications, American Rose Society.

* Mr. Frederick L. Atkins had kindly consented to preside, but was unable to be present on account of the illness which terminated in his death on November 10.

Friday, October 24. Chrysanthemum Day.
Leader: Mr. H. E. Downer, Horticulturist, Vassar College.

The total attendance at these functions was 387, or an average of over 55 members and guests on each occasion.

## Exhibit at the Brooklyn Savings Bank

Through the courtesy of the Brooklyn Savings Bank an exhibit of the educational and scientific work of the Garden was on view from November 17th to December 6th. The exhibit was installed in the handsome long corridor leading from the bank to its Fulton Street entrance, and was the first of a series of exhibits sponsored by the Bank, entitled "Know Brooklyn." Two tables were placed at each end of the corridor, one showing a model of the Children's Gardens together with samples of work done in the children's classes, the other displaying a collection of plants suitable for culture under modern apartment house conditions and styled "Exhibit of House Plants." Near the latter was placed a Wardian case equipped with suitable plants. On the west wall and on a narrow platform constructed along its base the work of the Garden was represented in some detail, including the following features:

1. Maps of the Garden plantations.
2. Diagrams showing the organization of the Garden and of its educational work, and its cooperation with other institutions.
3. Enlarged photographs of children's, high school, and adult classes at the Garden.
4. Samples of study material distributed to schools, and Riker mounts loaned.
5. Poster showing petri dishes filled with agar. These had been distributed to schools and exposed under various conditions by the students themselves.[1]
6. Water colors of types of Japanese Irises painted by Miss Purdy and Miss Mansfield.
7. Exhibit of current issues of publications of the Garden and map of the world showing points reached in their distribution.

[1] This was made possible through the cordial cooperation of the students in the biology classes at the John Adams and Thomas Jefferson High Schools.

8. Riker mounts of cereals, and mounts showing hybridization of sorghum, prepared by the department of plant pathology for the use of the high schools.

9. Exhibit of pressed specimens of tropical water lilies collected from plants in the Garden lily pools and prepared by Dr. Svenson to show retention of color.

10. Drawings by Mr. Caparn of proposed new features of the Garden, some of which have already been added.

11. Enlarged photographs and mounts showing work going forward at the Garden on hybridization of chestnuts for the purpose of securing disease-resistant forest tree types.

During the first two weeks of the exhibition a display of varieties of the cabbage plant, including Brussels sprouts, kale, kohl rabi, Georgia collards, Savoy cabbage, and ordinary cabbage was on view in an alcove on the east side, but the poor light available finally necessitated its removal.

It is estimated that about 3000 people came, and many favorable comments were received. The Brooklyn Savings Bank mailed about 20,000 descriptive circulars telling of the exhibit and of the work of the Brooklyn Botanic Garden.

## Editorial Work

I continued to serve on the editorial board of the *American Journal of Botany*, and also as editor of the Plant Section of General Biology for *Biological Abstracts*, and as editor of the Brooklyn Botanic Garden *Contributions*. As editor of the Brooklyn Botanic Garden *Leaflets* I am pleased to report that as usual ten numbers were issued, as follows:

Nos. 1–2. Spring Planting. By Montague Free. April 2.

No. 3. Fertilizers for City Gardens. By Montague Free. April 30.

No. 4. The Principal Groups of Fossil Plants. By Alfred Gundersen. May 14.

No. 5. The Plant Wards of New York State. By Ralph C. Benedict. June 4.

No. 6. The Rose Garden of the Brooklyn Botanic Garden. By Montague Free. September 10.

Nos. 7–8. Cabbages in the Classroom. By Ralph C. Benedict. October 29.

Nos. 9–10. Forms and Functions of Roots. By Arthur H. Graves. December 17.

## Publicity

Our newspaper releases relating to the activities of the Garden, such as new plants acquired, plants in bloom, improvements in the Garden plantations and conservatories, courses of study and lectures, results of research, etc., went forward as usual, with the cooperation of Mrs. Warner of the Brooklyn Publicity Bureau. Twenty-one news releases containing 47 articles about the Garden were sent out to the various metropolitan dailies. 745 clippings were received, as against 792 for 1929.

## Miscellaneous

*Bureau of Information.*—Since I have referred to this part of my work in former reports in some detail, I have been tempted to omit any reference to it this year; and yet so many letters and inquiries—the latter both in person and by telephone—are answered in the course of the year that a considerable proportion of my time is here represented, and for the sake of mathematical justice it would seem that at least mention of it should be made.

*Post Card Bulletins.*—Post card bulletins were sent to members on February 28th, announcing the file of nursery and seed catalogs available for reference in the Library. On March 8th a notice was mailed to the effect that 1200 *Boltonia asteroides*, 300 perennial asters, and 300 *Sedum acre* plants were available for distribution. No special post cards were sent announcing the flower displays of the Garden, since the Flower Day announcements themselves answered this purpose.

*Inspection of Plants.*—In answer to requests several trips were made to inspect plants showing symptoms of disease. One of these cases is the famous Cedar of Lebanon at Flushing, the trunk of which is much in need of repair. Suggestions for suitable treatments were made.

*List of Woody Plants.*—At the request of the Committee on requirements for examination of candidates for first assistant in biology for New York High Schools, I prepared a list of the "Important Woody Plants (trees, shrubs, and climbing plants)

Occurring in the Greater New York area." This list comprises 146 species and includes the more commonly cultivated kinds. The Board of Examiners has authorized the statement that, so far as woody plants are concerned, candidates will not be expected to be acquainted with any species not included in this list.

*Visit of Biology Teachers.*—On Saturday, October 18th, a delegation of the biology teachers of Greater New York visited the Garden under the guidance of Dr. Benedict to see some of the results of research now in progress. Jimson weed grown by Dr. Reed to illustrate Mendelian inheritance, sorghum hybrids in the experimental plot also grown by Dr. Reed, and cabbages and cabbage varieties grown by Dr. Benedict were some of the features of particular interest.

*Docentry.*—During the spring and fall several garden clubs and other organizations were conducted through the Garden and Conservatories by members of this department.

*Other Personal Activities.*—At the Children's Fair, held at the American Museum of Natural History, December 4 to 10, I served on the committee of judges of the exhibits. From December 28 to 31, as a delegate from the Garden, I attended the annual meeting of the American Association for the Advancement of Science, at Cleveland, Ohio.

Lists of lectures and talks given to schools, clubs, and other organizations during the year, of field trips conducted and articles published, have already been submitted.

*Research.*—The report of research carried on during the year (pp. 83–88) has also been submitted.

Respectfully submitted,

ARTHUR HARMOUNT GRAVES,
*Curator of Public Instruction.*

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## REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1930

DR. C. STUART GAGER, DIRECTOR.

*Sir:* I hereby present the nineteenth annual report from the Department of Elementary Instruction.

Since the work of this Department has followed along the general lines well-known to you and to our Board of Trustees, I shall simply pick out the high spots in our work.

It will be of interest to note the fact that we have come in contact with over 600,000 children in our different lines of activity. This seems a rather significant figure, although if comparisons are made between the figures of the current year and last year, there are places which show a decrease. This is due to the fact that we have reorganized our headings under which certain reports are made, but the total figures for the contacts of this year are greater than those of the preceding years.

Our work with the distribution of material and with assistance rendered in starting Nature Rooms, both in the schools of this Borough and other boroughs, has increased.

One class in greenhouse work has been added to the number of classes given in our extension courses. The demand for greenhouse work among the teachers is heavy and it seemed wise to add one more class instead of allowing the beginners' class, B3, to increase. This class was limited to 60 members during the year 1930–1931, but in reality we had a registration of 69.

The total registration in children's Saturday morning classes for the year (this includes spring, summer, and fall classes) was nearly 600. The registration is larger than that in most of our private progressive schools.

The perennial border in the Children's Garden was remade this year. The Shakespeare Garden has increased in beauty by the addition of flagged paths, and is, as always, one of the most used and interesting features of the Children's Garden. This summer represented one of the best seasons we have had for outdoor summer work. During the season we had more children added to the work than we have had for some years.

In the fall classes the range of age ran from five years to college students. We had three college students who, of course, were boys and girls belonging to our garden for years. It is a satisfaction and a compliment to the work that these young people, if they attend a New York City college, stay with us just as they did in their childhood days. Twice a year our boys and girls work for their silver pins. This work is independent work on special sub-

FIG. 11. Classes from the Schools come in Winter, as well as at other Seasons. The Guide-sheets, given to each pupil, serve to make the work more definite and help in the Follow-up Work at School. January 16. (6476.)

jects chosen by the child under the supervision of the Acting Assistant Curator, and is carried on during the months of January, February, March, and the summer season. This summer special problems, with no regard to honors, were carried on by different boys and girls in the garden. The subjects taken up were the following: The Growth and Study of Different Members of the Cabbage Family; How Different Fertilizers Affect the Growth of Kohlrabi; Herbs; Study of the Effect of Mulch Paper upon Common Vegetables, such as Tomatoes.

The total number of packets of seed which left our seedroom was over a million. Some of these seeds, of course, were used in our Brooklyn Botanic Garden teachers' and children's classes, and some of them were given to institutions to assist their work, so the million packets do not represent the actual sale of seed, but this figure does represent the output of labor.

Martin Nash received the Alfred T. White Scholarship for the year of 1930. He is a freshman at Long Island University.

Nearly 200,000 people were affected by the conferences held by the Curator. These conferences for the most part represent plans for nature study and gardening for elementary schools in our own borough. These plans are not plans for the future, but they represent active and immediate work.

It is difficult to ascertain the number of people viewing exhibits set up by the Department. For example, the one placed in Abraham & Straus' store was viewed by numberless people, but the exact number was never accurately determined. The Department also set up an exhibit in the *Brooklyn Eagle* Building as part of a children's exhibit and won for this a silver cup representing the best exhibit set up.

As a new feature in our school contacts, the Brooklyn Botanic Garden this year gave a medal to all schools having school gardens up to a certain standard. Delegates from the schools receiving medals came to the Garden and received their honors. Mr. Van Evrie Kilpatrick, Director of Nature Garden Work for the Board of Education, spoke on that occasion. Twenty-five schools received medals.

There have been many changes in the personnel of the Department during this year, and it might be fitting here to say that the

regular work continued without a break. The Acting Assistant Curator, Mrs. Kathryn Clark Bartlett, resigned as of March 31. Miss Zelda J. Sargent resigned on April 30; Mrs. Lucile MacColl on July 15, and Miss Elizabeth Marcy on August 31.

Miss Margaret M. Dorward was appointed on March 17. Miss Dorothy Jenkins was appointed temporarily from April 1 to July 15, and then permanently from that time on. Miss Frances M. Miner came on September 1.

One of our own students, Miss Rosemary Kennelly, carried on the work of the Children's Garden at the Brooklyn Home for Consumptives.

I was asked to go to Cleveland, Ohio, to set in motion plans for a Garden Center for Cleveland. This was successful, and one of the few Garden Centers in the world is fairly launched in that city. The work of the Garden Center is to assist people in their plans for home gardens.

I continued to serve as Honorary Secretary of the National Plant, Flower and Fruit Guild.

My term of office as Secretary-Treasurer of the American Nature Study Society ended with the December meeting of the Society in Cleveland.

During 1930 the Curator wrote a weekly article for the New York *Sun*. Because of the popularity of those articles during 1929, the *Sun* started a Garden Page which is published every Saturday. The School Nature Study Union of England asked for an article on our work to appear in their own official organ. This article was published in July. An educational article on "The Value of Nature Study in the Life of a Child" was written for the *Delineator* in May, an article which has been used by the public schools in their work. An article on "Window Boxes" published in 1929 in *Your Home* is to be re-published in England by the Amalgamated Press. This was requested by the Press in London and came through no effort on the part of the *Your Home* Company nor the Brooklyn Botanic Garden.

I would like to bring to your attention the following needs in the Department. First, a seed-filling machine. Considered as a whole, the seed work takes nearly one-half year of time of one assistant. This time should be put into strictly educational work.

The work in our three greenhouses has more than doubled in the last two years. These two things taken together represent an enormous amount of mechanical detail. The demand upon us for assistance in starting Nature Rooms and in helping schools is so great that the Curator feels the time of assistants would far better go to such work than to the mechanics of the seedroom and too much detail in the greenhouses. Perhaps one concrete example would open up a clearer understanding of this situation. When our teachers' beginners' class in greenhouse work meets, it takes the time of one person the entire day to set up the greenhouses for the class, to wrap up plants, and be ready for the proper running of the class. An extra assistant who could do more of the mechanics of the job and free the educational assistants would be a step forward.

Again I would like to put on record the need of a bus for visiting classes and a car for the use of all departments where the distribution of material and the transporting of individuals is concerned.

Respectfully submitted,

ELLEN EDDY SHAW,
*Curator of Elementary Instruction.*

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## REPORT OF THE LIBRARIAN FOR 1930

DR. C. STUART GAGER, DIRECTOR.

*Sir:* I submit herewith the report on the library for the year 1930.

### Accessions

During the year, there were added to the book collection 1,067 volumes and 844 pamphlets, making a total on December 31 of 15,851 volumes and 11,952 pamphlets, or a grand total of 27,803.

More than 100 volumes were received as gifts from authors, members of the Garden staff, scientific associations, institutions, and others who are interested in the work of the Garden. Special acknowledgment should be made to Mr. Henry S. Adams, Brooklyn, who presented several expensive volumes on gardens; to the Brooklyn Museum Library for a collection of interesting out of

FIG. 12. Pupils of Public School 206, Brooklyn, about to carry home plants they have raised at the Botanic Garden. The course of instruction covered a period of six weeks. (7034.)

print books and pamphlets on botanical subjects; to Baron Kishichiro Okura, Tokyo, for the "Catalogue of the Okura Exhibition of Japanese Art held at Rome," consisting of two large folio volumes of plates including many reproductions of Japanese flower painting; and to six members of the Woman's Auxiliary and one other friend of the Brooklyn Botanic Garden for the gift of "Aristocrats of Japan's National Flower," consisting of 50 plates of chrysanthemums. Several rare Japanese books on Iris, secured by Dr. Reed during his recent trip to Japan, were purchased from a special Iris Fund made up of contributions from the American Iris Society and about a dozen friends of the Garden. Such generous gifts are deeply appreciated, since the library must depend on its friends for expensive and unusual acquisitions of this kind.

Purchases of books have been divided between current publications and important out of print works desired in rounding out our collection. We were fortunate in securing a number of scarce botanical classics as well as runs of several periodicals needed to fill in sets.

The rare books by early botanical writers were purchased from the income of the Benjamin Stuart Gager Memorial Fund, which was given for this special purpose. Many other important works and periodical sets were checked in booksellers' catalogues but could not be ordered because all available funds were exhausted. Besides the usual allotment for books, an additional amount of at least $5,000 could be expended to advantage during the coming year for needed books of this kind which are becoming increasingly scarce and expensive.

### *List of Some Important Accessions*

Albertus de Bollstaedt (Magnus). Liber secretorum de virtutibus herbarum, et animalium quorundam. Venetiae. 1502. (Probably falsely ascribed to Albertus de Bollstaedt.)

Aldrovandus, Ulyssis. Dendrologiae naturalis . . . libri duo. Bononia, 1668 (Colophon, 1667). (First edition.)

Annales d'horticulture et de botanique, ou flore des jardins du royaume des Pays-Bas. V. 1–5, 1858–62.

Asami, Yoshichi. The crab-apples and nectarines of Japan. Tokyo, 1927.

Bauhin, Johann. Historia novi et admirabilis fontis balneique Bollensis . . . Montbéliard, 1598.

Botanische mittheilungen aus den tropen. Ed. by A. F. W. Schimper. V. 1–9, 1888–1901.
Botanische zeitung. Berlin, 1872–1888.
Botanische zeitung. Regensburg. V. 2–5, 1803–06.
Botaniska notiser. 1911–1922.
Calcutta, Royal Botanic Garden. Annals. V. 1–12, 1888–1918. (This set was owned by Dr. Andrew Thomas Gage, Superintendent of the Calcutta Botanic Garden, and contains his bookplate.)
Candolle, August Pyramus de. Essai sur les propriétés médicales des plantes. Paris, 1816.
Celsus, Aulus Cornelius. De re medica libro octo. Paris, 1529.
Darwin, Charles R. Descent of man. 2 vols. London, 1871. (First edition.)
—— Effects of cross and self fertilization in the vegetable kingdom. London, 1876. (First edition.)
—— Power of movement in plants. London, 1880. (First edition.)
Dodoens, Rembert. Cruydt-Boeck . . . Leyden, 1618.
—- Florum, et coronariarum ordoratarumque nonnullarum herbarum historia. Antverpia, 1568. (First edition.)
—— New herbal, or historie of plants . . . London, 1619.
Duhamel du Monceau, Henri. Traité de la conservation des grains. Paris, 1754.
Gesner, Conradus. De raris et admirandis herbis. Tigurum, 1555.
Grand'Eury, F. Cyrille. Memoire sur la flore carbonifère du département de la Loire. 3 vols. Paris, 1877.
Hooke, Robert. Micrographia. London, 1665.
Hortus sanitatis Deutsch. Peter Schöffer. Mainz, 1485. (Facsimile edition, Munich, 1925.)
Index Londinensis. V. 2–4. Oxford, 1930.
Internationale mitteilungen für bodenkunde. Berlin. V. 1–10, 1911–20. (Reprint.)
Ito, Ihei. Chikinsho-furoku (Supplement to Universal knowledge of vegetation). 4 vols. Yedo, 1733.
—— Kojaki-chikinsho (Universal knowledge of vegetation). 8 vols. Yedo, 1719.
—— Zoho chikinsho (Revised Knowledge of vegetation). 8 vols. Yedo, 1710.
Japanese prints. (A collection of 16 colored prints featuring Iris.)
Kaempfer, Engelbert. Amoenitatum exoticarum . . . Lemgo, 1712.
Kono, Bairen. Chi-Kusa-no-hana (Thousand varieties of flowers). 4 vols. Kyoto, 1892.
LaRoque, Jean de. Voyage to Arabia the happy. London, 1726.
Linné, Carl von. Fundamenta botanica. 3 vols. Colonia-Allobrogum. 1786–87.
—— Genera plantarum. 2 vols. in 1. Francofurtum, 1789–91.
—— Philosophia botanica. Stockholm, 1751. (First edition.)

—— Philosophia botanica. Berlin, 1780. (Contains an autograph letter signed from Sir J. A. H. Murray to Sir William Thiselton-Dyer, Director of Kew Gardens, regarding Linné's use of the word "palatum".)
—— Systema vegetabilium. 15th edition by C. H. Persoon. Gottingen, 1797.
—— Systema vegetabilium. 16th edition by C. Sprengel. Gottingen, 1825–28.
Lobel, Matthias. Plantarum seu stirpium icones. Antverpia. 1581. (First edition.)
Lonitzer, Adam. Kreuterbuch. Franckfurt, 1573.
—— Naturalis historiae opus novum. 2 vols. Francofurtum, 1551–55.
Malpighi, Marcello. Opera posthuma. Venice, 1698.
Matsudaira, Sakingo. Hana shobu baiyoroku. Record of the cultivation of Iris Kaempferi written in 1853. MS, copied from the MS volume in the Imperial Library, Tokio, by Bunkio Matsuki, 1930.
—— Hana shobu kamei. Catalogue of 120 varieties of Iris Kaempferi written in 1856. MS, copied from the MS volume in the Imperial Library, Tokio, by Bunkio Matsuki, 1930.
Mattioli, Pierandrea. De i discorsi nelli sei libri di Pedacio Dioscoride Anazarbeo, della materia medicinale. 2 vols. Venetia, 1604.
—— New kreuterbuch. Prag, 1563.
Miller, John. Illustratio systematis sexualis Linnaei. 2 vols. London, 1777.
—— An illustration of the sexual system of Linnaeus. 2 vols. London, 1794, 1789.
Myioshi, Manabu. Koganei sakura-hana zusetsu (Illustrations of the cherries of Koganei). 2 vols. Tokyo, 1927–28.
Mizuno, I. Somoku kinyo shu (Collection of variegated plants). 8 vols. Kyoto, 1829.
Nederlandsch kruidkundig archief. 1871–1930.
Okura, Kishichiro (Baron). Catalogue of the Okura exhibition of Japanese art held at Rome . . . 1930. 2 vols. Tokyo, 1930.
Persoon, Christian Hendrick. Icones pictae specierum rariorum fungorum in synopsi methodica descriptarum. Pts. 1–4. Paris, 1803–08.
Ray, John. Collection of curious travels and voyages. 2 vols. in 1. London, 1693.
Reichenbach, Heinrich G. L. Iconographia botanica exotica . . . prima centuria tabularum. Lipsia, 1827.
Revue de botanique: bulletin mensuel de la Société francaise de botanique. V. 1–13, 1882–95.
Scaliger, Julius Caesar. Commentarii et animadversiones in sex libros de causis plantarum Theophrasti. Geneva, 1566.
—— In libros de plantis Aristoteli inscriptos, commentarii. Geneva, 1566.
Senebier, Jean. Essai sur l'art d'observer et de faire des expériences. 3 vols. Geneva, 1802.
Sociedade Broteriana. Boletin. V. 1—Ser. 2, V. 5, 1880–1928.

Societas pro fauna et flora fennica, Meddelanden. Nos. 23–50, 1898–1924.
Société royale d'agriculture et de botanique de Gand. Annales. V. 1–5, 1845–49.
Sugiyama, Seijiro. Aristocrats of Japan's national flower. 2 vols.
Tournefort, Joseph Pitton de. Histoire des plantes qui naissent aux environs de Paris. 2 vols. Paris, 1725.
—— Institutiones rei herbariae. 3 vols. Paris, 1719.
Vahl, Martin. Icones illustrationi plantarum Americanarum. Haunia, 1798–99.
Zanoni, Giacomo. Istoria botanica. Bologna, 1675.

## Autograph Letters and Association Books

Additions to the autograph collection include letters of Darwin, David Don, Oswald Heer, J. S. Henslow, Huxley, Franz Unger, Sir William Hooker, one from William Ewart addressed to Sir Joseph Hooker, and one from Sir James Murray, editor of the Oxford dictionary, to Sir William Thiselton-Dyer, Director of Kew Gardens, regarding Linné's use of a botanical term. Several of these letters were taken from an old scrapbook which once belonged to Charles C. Babington, Professor of Botany at Cambridge University, and were found last summer by Dr. Gager in a Cambridge book-shop. A letter from the late Dr. E. H. Wilson was added to the collection because of its interesting content which records his "firm conviction" that the Ginkgo Tree exists nowhere today in a wild state.

Some interesting association books acquired were the following: a presentation copy ("from the author") of Darwin's "Notes on the Fertilization of Orchids"; "Notes on the Flora and Fauna of Round Island" by Henry Barkly and Nicolas Pike bearing on its title-page the autograph of Colonel Pike, an old Brooklyn resident who made original contributions to the knowledge of insular and marine flora and fauna while serving as American Consul at the Island of Mauritius; a fine set of the "Annals" of the Royal Botanic Gardens at Calcutta, in twelve folio volumes, formerly owned by Dr. Andrew Thomas Gage, Superintendent of the Garden; a copy of the "Alphabetical Catalogue of Plants in the Garden of Thomas Hanbury," presented to Sir Daniel Morris by Hanbury and containing the latter's autograph; and also Sir Daniel Morris' copy of "Reports on the Scientific Results of the Voyage of H. M. S.

Challenger" which was "Presented by Her Majesty's Government." The last two contain Sir Daniel's bookplate.

## Exchanges

The library receives over 900 serials, including periodicals and publications of botanical gardens, agricultural experiment stations, scientific societies and institutions. More than six hundred of these serials are sent in exchange for Brooklyn Botanic Garden publications. In many cases these "exchanges" had not been received regularly or had lapsed over a period of several years. A checking of the entire exchange list seemed advisable and the work was undertaken during the summer and early fall. As a result of correspondence many of the lacking publications have been secured or assurance received that copies will be forwarded as soon as issued. A few of the "exchanges" have been crossed off the list in cases where the replies or failure to answer indicated that continuation of the mutual arrangement was not desired.

## Use of the Library

While its main use is in connection with the scientific work of the Garden, the library is open also to the public for reference purposes, and the following actual cases during the past year are typical of the service rendered: an illustrator of children's books used colored pictures of Mexican flowers; a local physician who was preparing a book on hay fever made a study of the size and number of pollen grains of various flowers; a list of references in recent botanical literature to new species of Begonias was compiled for an agricultural experiment station in a neighboring state; a member of a committee of a local organization which is preparing a program for tree planting consulted articles on shade trees for city streets; a teacher in a summer camp wished a list of wild flowers which should be conserved; a high school graduate asked for information about schools giving courses in landscape gardening; a designer of silks used colored plates of flowers; the author of the annual article on botany in the New International Encyclopedia gathered his material in this library.

Other subjects studied were: bread fruit tree, dwarfing of trees,

agricultural schools, chemical analysis of alfalfa and carob bean, botanical apparatus, propagation of ferns, pictures of a jungle in India, wild flower gardening, African thorn tree, hedges for gardens, tung oil, leather as a fertilizer, state flowers, care of shade trees, greenhouse management, poison ivy, celery leaf-spot, Mediterranean fruit fly, lichens as food, effect of ultra-violet rays on tobacco plants, Japanese gardens, illustrations of a lemon blossom to be used in a candy advertisement, material for a talk to Girl Scouts on gardening, biographical sketch of the originator of the Boyd saxifrages, diseases of roses, plant introductions of Dr. E. H. Wilson, varieties and culture of oranges.

The collection of Pre-Linnean works now contains more than 250 volumes, and not only gives distinction to the library but has frequent practical value. Out of seventeen works of early botanists requested on one occasion for the use of a group of high school teachers who were making a study of the history of botany, the library possessed fourteen, half of them in contemporary editions. An illustrator for a publishing house came several times to study old herbals for antique style of plant drawing. On another occasion the herbals were used by a book collector who was interested in colored illustrations in the early days of book making. A specific case was the use of Mattioli's Herbal of 1559 for contemporary evidence on the dates of the founding at Padua and Pisa of the oldest existing botanic gardens.

## Interlibrary Loans

Thirty-seven volumes were lent to libraries of the following institutions: Brooklyn Museum, Boyce Thompson Institute, Columbia University, Glen Ellyn (Illinois) Free Public Library, New York University, Rockefeller Institute for Medical Research, Standard Oil Development Company, Elizabeth, N. J., United States Rubber Company, University of Tennessee, H. W. Wilson Company.

Thirty-eight volumes were borrowed for the use of the Garden staff from the American Museum of Natural History, Brooklyn Museum Library, Brooklyn Public Library, and Columbia University.

## Miscellaneous

The customary exhibits of books were arranged for the spring inspection and special flower days, also a display of seed and nursery catalogues during the week of March 3–10.

The installation of the new book cases on the balcony and second floor of the stack-room provided shelf space in the main library for several thousand volumes which had been stored in the basement for a number of years. This made necessary the moving and rearrangement of the entire book collection.

A large accumulation of duplicates, comprising books, pamphlets and periodicals received from time to time as gifts or in exchange for Brooklyn Botanic Garden publications, was offered for sale to booksellers and finally disposed of for a substantial sum.

Through arrangement with the American Fern Society, all the books belonging to the Society have been deposited in our library where they will be maintained as a separate collection. They are available for general use in the library or may be borrowed by the Society or other organizations or institutions under the same rules and regulations that govern the loan of our own books (see Appendix 8, p. 164).

The statistical report follows.

Respectfully submitted,

CALVIN W. FOSS,
*Librarian.*

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# STATISTICAL REPORT ON THE LIBRARY

## Accessions

| | Volumes | Pamphlets | Parts (Including Periodicals) |
|---|---|---|---|
| Exchange | 36 | 50 | 3,981 |
| Gift | 101 | 450 | 2,013 |
| Publication | 0 | 141 | 329 |
| Purchase | 428 | 203 | 1,021 |
| By binding | 502 | 0 | 0 |
| Total | 1,067 | 844 | 7,344 |

| | |
|---|---|
| Total number of volumes in library, December 31, 1929 | 15,091 |
| Number of volumes added during 1930 | 1,067 |
| Number of volumes discarded during 1930 (duplicates) | 142 |
| Deposit collection returned to the Brooklyn Public Library, in 1928, but not deducted at that time | 165 |
| Total number of volumes in library, December 31, 1930 | 15,851 |
| Total number of pamphlets in library, December 31, 1929 | 11,108 |
| Number of pamphlets added during 1930 | 844 |
| Total number of pamphlets in library, December 31, 1930 | 11,952 |
| Total number of volumes and pamphlets in library, December 31, 1929 | 26,199 |
| Net increase of volumes and pamphlets during 1930 | 1,604 |
| Total number of volumes and pamphlets in library, December 31, 1930 | 27,803 |

## American Fern Society Collection

| | |
|---|---|
| Number of volumes received during 1930 | 22 |
| Number of pamphlets received during 1930 | 28 |
| Number of parts of publications received during 1930 | 40 |

## Serials and Periodicals

(Including only those of which numbers were received in 1930)

| | |
|---|---|
| Subscription | 122 |
| Gift | 115 |
| Exchange | 652 |
| Publication | 9 |
| Total | 898 |

## Cataloguing

| | |
|---|---|
| Books, Pamphlets, and Serials catalogued | 1,676 |
| Total number of cards typewritten and filed | 3,523 |

## Printed Cards

| | |
|---|---|
| Torrey Botanical Club index cards on file, December 31, 1929 | 40,359 |
| Filed during 1930 | 795 |
| Total, December 31, 1930 | 41,154 |

| | |
|---|---|
| Index Algarum Universalis cards, December 31, 1929 | 26,940 |
| Number of cards received during 1930 | 1,000 |
| Total Index Algarum Universalis cards, December 31, 1930 | 27,940 |
| Catalogue en fiches de la Bibliographie Technique et Agricole Tropicale, Institut Colonial de Marseille, December 31, 1929 | 4,816 |
| Number of cards received during 1930 | 1,690 |
| Total, December 31, 1930 | 6,506 |

### Miscellaneous

| | |
|---|---|
| Number of users of the library | 3,113 |
| Books lent to members of staff | 1,096 |
| Books lent to other institutions | 37 |
| Books borrowed from other institutions | 38 |

(*Note:* The decrease in the number of users reported is due to a change in the method of compiling the statistics. Previous to 1930 the number of readers, visitors, reference questions, and books lent were combined to show the total use of the library. On the same basis, the total for 1930 would be 6,638 as compared with 5,396 for 1929.)

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## REPORT OF THE HORTICULTURIST AND HEAD GARDENER FOR 1930

DR. C. STUART GAGER, DIRECTOR.

*Sir:* I have the honor to submit herewith my report for the year ending December 31, 1930.

### Personnel

As in 1929, there were nine men on the gardening force. Considering the amount of work to be done, more labor was available than in previous years. During the peak of the growing season sixteen laborers were employed. Five of these men were assigned as guards at the entrance gates on Saturdays, Sundays, and school holidays. Their duties included preventing the entrance of children unaccompanied by adults, and the bringing in of implements that might be used for digging in lawns and flower beds. This policy was instrumental in greatly reducing vandalism.

## Labor Paid for by Charitable Organizations

Beginning March 24th and ending December 12th, ten men worked for a total of 451 days of 6 hours. These men were paid by the Garden, the Garden being reimbursed by the Brooklyn Bureau of Charities.

Beginning November 17th, six men worked for a total of 20 days of 6 hours and 63½ days of 8 hours. These men were paid in part by the Brooklyn Association for Improving the Condition of the Poor, but mainly by the Emergency Work Bureau.

## General Systematic Section

A new fern bed was constructed and planted near the outlet of the lake. The old fern bed was completely remade and, in order to improve moisture conditions, was lowered about a foot below the surrounding level.

About 250 trees and shrubs were set out on the Azalea Knoll, at the south end of the garden. These consisted of pin oaks (for shade), *Azalea, Enkianthus* (three species), *Leiophyllum* (two species), *Picris,* and *Rhododendron.*

As in previous years the collections in the systematic section have been augmented by plants acquired by gifts, exchange, and purchase.

## Conservatory Plaza

As an aftermath of the construction in the Conservatory Plaza and vicinity of new steps, pool, and storerooms, the gardening and laboring force was involved in much work in the removal of subsoil, provision of topsoil, grading, and planting.

About 170 feet of privet hedge eight feet high, that screened the service yard, had to be re-aligned in order to obtain sufficient room.

The east and west flower borders of the Conservatory Garden were each extended southwards about 30 feet and partly planted.

Five privet bushes fifteen feet high were transferred from the north end of the conservatory garden to the south end. Eleven *Populus Bolleana,* averaging twenty feet in height, were planted on either side of the lower steps, China Fleecevine (*Polygonum Aubertii*) and Japanese Creeper (*Ampelopsis tricuspidata*) were planted to furnish the walls on both the upper and lower levels.

FIG. 13. View facing North in the General Systematic Section. From left to right: *Vitex Agnus-castus, V. Negundo var. incisa, Catalpa Bungei,* and *C. bignonioides.* July 26. (6024.)

A hedge of Box Barberry (*Berberis Thunbergii* var. *minor*) was planted around the semicircular pool at the north end.

In the pool containing the Jenkins fountain a retaining wall of concrete was built to hold soil for planting. This was then surfaced with between three and four tons of tufa rock.

The grass verges to the flower borders were graded and resodded.

## Boulder Hill

To replace Mugho Pines that failed to thrive, the area in the immediate vicinity of the Alfred T. White Memorial was planted with Rhododendron and Mountain Laurel. The material used was derived partly by purchase and partly by "thinnings" from our original Rhododendron planting.

Over 400 square yards of ground was prepared for Rhododendrons (to be planted spring 1931) by working the soil eighteen inches or two feet deep and mixing with it granulated peat moss and sand.

The trail meandering along the crest of the hill was surfaced with broken flagstones for a distance of 550 feet. A trail with a foundation of ashes was made from the Jenkins foot-bridge, at the lake outlet, to the main walk near the Japanese tea house. This involved considerable regrading.

Depressions brought about by wear and tear, etc., were brought up to grade by filling with topsoil, and reseeded with grass.

On the west side of the hill 1000 bulbs were used to extend northwards the planting of Narcissus "Sir Watkin."

## Rose Garden

Thirty ornamental concrete posts with "vase" finials, designed by Mr. Caparn to support festoons of roses, were made by our own men during the winter. In early spring these were set out, chains attached, and 40 climbing roses planted to furnish them.

The work of replanting the species borders, started in 1929, was completed during the fall of 1930.

Rooted cuttings of 56 species of *Rosa* were received from the Arnold Arboretum and 22 grafted plants of varieties of "moss" roses were received from the Jackson and Perkins Co. These

were set out in the nursery. When they attain sufficient size to be planted in the rose garden they will enable us to eliminate many of the duplicates in the species borders.

## Local Flora Section

In connection with the remodelling of the "Local Flora" section, many "weed" trees and shrubs were removed. These included such species are *Ailanthus glandulosa, Acer pscudo-platanus, Ligustrum,* etc. One hundred and thirty trees and shrubs of species belonging in the local flora area were planted to take their place.

Excavations were made for a pool, and topsoil from adjacent areas removed, to make room for sand to be secured in 1931. It is proposed to utilize this area to exhibit the vegetation of the pine barrens.

The soil from the acid bog, which had become almost neutral, was removed, and considerable necessary grading done.

Over 700 square yards of ground was prepared for Rhododendrons that it is proposed to set out during the spring of 1931. This planting is intended, in part, to mask the new fence enclosing the local flora section.

## Ornamental Planting

Bulb planting in addition to that already mentioned consisted of extending the Crocuses in the lawn among the Shrub Honeysuckles towards the north by planting 2000 corms.

One thousand Narcissus "Emperor" were used to extend the planting of this variety in the Pomaceae area.

Two beds along the brook, formerly occupied by Iris, were planted with Gladiolus.

Two hundred plants of the Memorial Rose, *Rosa Wichuraiana,* were planted on the terrace bank north of the esplanade and on the steep banks on either side of the walk near the Oak collection. It is hoped that this planting will solve a difficult maintenance problem.

Thirteen trees of Japanese Flowering Cherries were planted on the south shore of the lake and ten Weeping Cherries on the east bank.

More than 30 large Lilac bushes were replanted to strengthen the line around the Lilac Triangle and to better space some varieties that were becoming crowded.

A Japanese Barberry hedge, 270 feet long was planted at the base of the Museum bank.

## Miscellaneous

The area southwest of the Reservoir, a little over one acre, was graded and seeded with lawn grasses. The rough trail that extended from the north Flatbush Avenue entrance to the tar macadem road was dug out for a distance of over 200 feet and a road nine feet wide of cobble stones surfaced with ashes substituted. The increasing use of this entrance by visitors made this desirable, as the old trail at certain seasons was extremely muddy.

A flagstone walk, 150 feet long, was made as a "short cut" between the service gate of the reservoir and the road leading to the north Flatbush Avenue entrance. These flagstones and those used on Boulder Hill were obtained, for the hauling, when the flagstone walk extending from the Flatbush Avenue service gate to Empire Boulevard was replaced by one of concrete.

Two "shanty" tool houses that for many years stood amongst the shrubbery opposite the Japanese tea house, were torn down, the surroundings graded and converted into lawn. Aesthetically this is a great improvement.

The boulder retaining wall along the lake shore, south of the Japanese tea house, was rebuilt to eliminate the harsh line that formerly existed.

Lattice panels and fasciae were put in place on the north side of the north pergola of the Rose Garden.

A flight of concrete steps and gate pillars of concrete were constructed at the south entrance of the Rose Garden.

Two flights of concrete steps were made at the north end of the esplanade.

Two garden seats of concrete and wood were set up and concrete platforms cast.

Concrete pillars were made and erected, and a wooden gate was constructed and hung at the garden entrance to the service yard.

FIG. 14. Rose Garden. General View facing South, North Pergola in the foreground, and the two Rows of Festoon Posts. June 23, 1930. (6957.)

The concrete copings surrounding two window areas at the north end of the laboratory building were raised eighteen inches. Subsoil from the Conservatory Plaza construction was hauled in to make the grade slope away from the building. It is hoped that these measures will put an end to the nuisance of occasional flooding of the hall and rooms in the lower part of the building.

Three soil bins with concrete walls and floors were constructed in the service yard.

Two manholes with concrete walls and slab covers were constructed over the sewer that runs through the center of the garden. These were made to enable us more readily to remove poplar and willow roots that invade the sewer.

## Seed and Plant Distribution

In connection with the International Seed Exchange, 2397 packets of seeds were distributed to foreign and domestic botanic gardens and to other institutions and individuals during the spring of 1930.

Over 5300 plants were distributed to Botanic Garden members.

## Personal Activities

In June, and again in September, I acted as one of the judges in the garden contest sponsored by the Jackson Heights Garden Club.

I am continuing to serve as a Local Secretary of the American Rose Society.

I attended the meeting of the American Rose Society at Atlantic City on September 11th and spoke on "The Work of Municipal Rose Gardens."

Respectfully submitted,

MONTAGUE FREE,
*Horticulturist and Head Gardener.*

# REPORT OF THE RESIDENT INVESTIGATOR FOR 1930

DR. C. STUART GAGER, DIRECTOR.

*Sir:* I herewith submit a report of the various activities in which I have engaged during 1930.

## Genetics of Brassica

A beginning at a new undertaking was started during the year with the more extensive culture of varieties of the genus *Brassica,* including cabbage, mustards, turnips, etc. Two problems present themselves as of interest: first, an analysis of the types of variation presented by this multiform group; second, hybridization experiments, in a preliminary way, to learn whether the group offers favorable ground for genetic analysis. In general, the cabbage types are so greatly diversified (one grower estimates that there are several hundred distinct forms in cultivation in different parts of Europe), and ordinary commercial seed often shows so wide a variation, that the genetic problem may prove to be almost impossibly complicated. There is, however, need for the comparative description and illustration of the distinctive varieties from a botanical point of view.

## School Service

In New York City, where contact with nature is necessarily limited for most people, it has seemed important to me to call attention to the biological interest which attaches to the common products of the markets. It was in this connection that the culure of cabbage types was first undertaken, and for this purpose a Botanic Garden *Leaflet* article, "Cabbages in the Classroom," was prepared and distributed among biology teachers. A similar paper, "Lessons in Apples," was published in Torreya earlier in the year, in which some reference was made to the botany and genetic history of apple types. A third paper, "A Laboratory Lesson in Variation," dealing with the Boston fern as useful class material, was prepared for the November–December *Torreya,* the publication of which was delayed until January, 1931.

Here also should be cited cooperation with Dr. Reed and Dr. Graves in promoting relations between the Garden and high school

biology teachers. During June, collections of young plants of some twelve varieties of *Brassica* were made available for high schools. In October, a group of biology teachers were shown the outdoor cultures of these plants on an appointed Saturday. Several book reviews, committee reports, and other articles were published

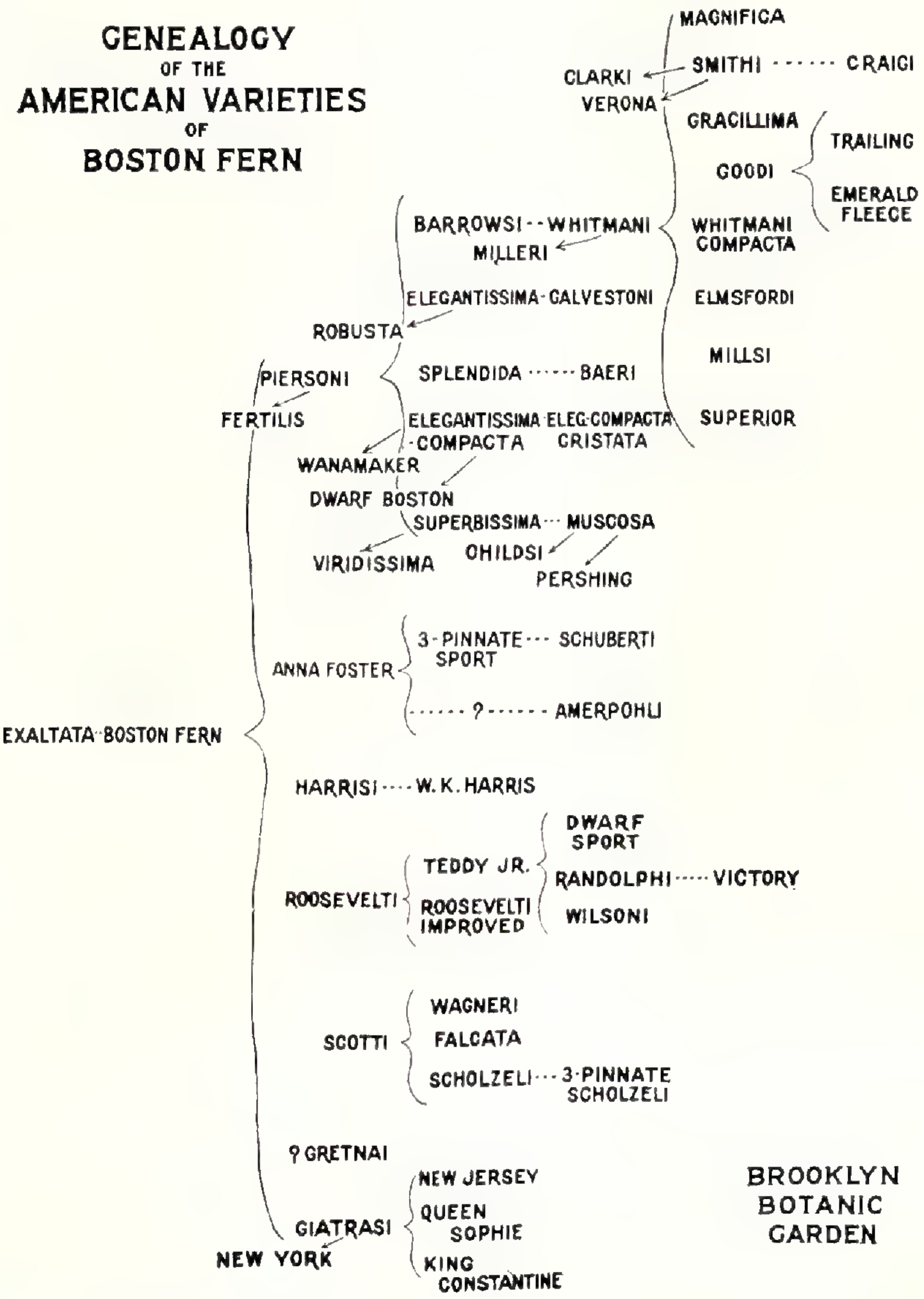


FIG. 15. Genealogy of the American Varieties of the Boston Fern (*Nephrolepis exaltata*). (3819.)

in the public high school journal, *Bulletin of High Points,* as noted elsewhere.

At the May field meeting of the New York Association of Biology Teachers, I was leader for the study of ferns. As rep-

resentative of the biology teachers on the Standing Committee on Science, which serves in a supervisory capacity for all high school science, I helped plan and work out a new method of selecting candidates for the license of first assistant (chairman of department) in the sciences. Further, in this connection, as chairman of the special Appraisal Committee for Biology, I have been engaged for the last two months of 1930 in visiting over twenty-five high schools to inspect the work of the thirty-four applicants for this license in biology.

As chairman of the Program Committee of the Biology Teachers Association, I have arranged for six of the eight speakers on the current year's program: Drs. McDougal, Rhoads, Merrill, Murphy, Snedden, and Melander. In June I was appointed as a member of a new State Education Department committee to prepare a syllabus for General Biology, designed as a second year subject. Two articles have been prepared and accepted for publication in *School Science and Mathematics*. One of these includes a review of the *American Journal of Botany* as a source book for biology teachers.

Beginning in September, I have been giving a course in " Methods of Teaching Biology " in the new Brooklyn College of the City of New York. For one session, the class met in the Botanic Garden Library with the assignment to look up (in the pre-Linnaean collection and elsewhere) some of the early reports of important discoveries in elementary biology. A number of the class have since been rather frequent in visiting the Garden, both for material and for reference work. One has become a Garden member.

## Editorial Work

As one of the editors of the *American Fern Journal,* and as fern representative of the Garden, a large amount of correspondence has been taken care of. The *Fern Journal* completed its twentieth volume with 1930, and celebrated by publishing an extra-sized volume, with articles from noted fern workers from widely separated regions. The *Journal* now has over 2800 pages in its twenty volumes. Its circulation and influence are continuously growing.

Part of this correspondence has related to the installation of the

American Fern Society Library on the Garden shelves during the past year. This event, most happy for the Fern Society, is to be signalized by a publication of a special supplement of the *Fern Journal,* which will include a statement of the formal Agreement between the Botanic Garden and the Fern Society, together with lists of the titles of the fern books, both of the Fern Society and of the Botanic Garden, with a statement of conditions under which these may be borrowed.

### Conservation of Native Plants

The amendments to the State Conservation Law, relating to native plants, first proposed by the Syracuse Botanical Club in 1929, were again introduced at the behest of the same organization, and this time successfully carried through both legislative houses and finally signed by Governor Roosevelt, becoming active on April 10, 1930. To help spread the message of conservation, and the particulars of this specific law, a *Leaflet* article, "The Plant Wards of New York State," was prepared and published in June. This includes a statement of the new law, together with two significant pictures: one showing East Green Lake (near Syracuse) in its earlier condition; the second, published by the courtesy of the Syracuse Post-Stancard, in its present state, as a refuse dump for waste rock.

Respectfully submitted,

RALPH C. BENEDICT,
*Resident Investigator.*

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## FINANCIAL STATEMENT FOR 1930

### I. Tax Budget Accounts

| | | | |
|---|---|---|---|
| 1360 | *Personal Service:* | | |
| | Appropriation ..... | | $ 78,120.00 |
| | Transferred from Miscellaneous New York City 3070 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions (10 months) ..... | 4,116.67 | $ 82,236.67 |
| | Expended ..... | | 82,236.67 |

1361 *Other Codes than Personal Service:*

Line 1 Fuel Supplies:

| | | |
|---|---|---|
| Appropriation | | $ 3,500.00 |
| Transferred from Miscellaneous New York City 3070 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions | 500.00 | $ 4,000.00 |
| Expended | | 4,000.00 |

Line 2 Office Supplies:

| | |
|---|---|
| Appropriation | $ 600.00 |
| Expended | 600.00 |

Line 3 Laundry, Cleaning and Disinfecting Supplies:

| | |
|---|---|
| Appropriation | $ 120.00 |
| Expended | 120.00 |

Line 4 Botanical and Agricultural Supplies:

| | | |
|---|---|---|
| Appropriation | | $ 1,850.00 |
| Transferred from Miscellaneous New York City 3070 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions | 1,000.00 | $ 2,850.00 |
| Expended | | 2,850.00 |

Line 5 General Plant Supplies:

| | |
|---|---|
| Appropriation | $ 400.00 |
| Expended | 400.00 |

Line 6 Wearing Apparel:

| | |
|---|---|
| Appropriation | $ 40.00 |
| Expended | 40.00 |

Line 7 Office Equipment

| | |
|---|---|
| Appropriation | $ 250.00 |
| Expended | 250.00 |

Line 8 General Plant Equipment:

| | |
|---|---|
| Appropriation | $ 2,000.00 |
| Expended | 2,000.00 |

| | | | |
|---|---|---|---|
| Line 9 | General Plant Materials: | | |
| | Appropriation | | $ 1,750.00 |
| | Expended | | 1,750.00 |
| Line 10 | Repairs and Replacements: | | |
| | Appropriation | $ 4,000,00 | |
| | Transferred from Miscellaneous New York City 3070 for Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions | 1,000.00 | $ 5,000.00 |
| | Expended | | 5,000.00 |
| Line 11 | Light, Heat and Power: | | |
| | Appropriation | | $ 425.00 |
| | Expended | | 425.00 |
| Line 12 | Telephone Service: | | |
| | Appropriation | | $ 375.00 |
| | Expended | | 375.00 |
| Line 13 | Carfares: | | |
| | Appropriation | | $ 60.00 |
| | Expended | | 60.00 |
| Line 14 | Expressage and Deliveries: | | |
| | Appropriation | | $ 300.00 |
| | Expended | | 300.00 |
| Line 15 | General Plant Service: | | |
| | Appropriation | | $ 500.00 |
| | Expended | | 500.00 |
| Line 16 | Contingencies: | | |
| | Appropriation | | $ 100.00 |
| | Expended | | 100.00 |

*Summary of Tax Budget Accounts:*

| | | |
|---|---|---|
| Appropriated | | |
| Personal Service | | |
| Original Appropriation | $ 78,120.00 | |
| Supplemental (by transfers) | 4,116.67 | $ 82,236.67 |
| Other Codes | | |
| Original Appropriation | $ 16,270.00 | |
| Supplemental (by transfers) | 2,500.00 | 18,770.00 |
| Total | | $101,006.67 |
| Expended | | 101,006.67 |

## II. Private Funds Accounts

1. *Endowment Fund* ($50,500.00) *Restricted* in Part:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 2,777.48 |
| Transferred to Endowment Increment Fund | $ 555.50 | |
| Transferred to Special Contributions | 2,221.98 | 2,777.48 |
| | | $ 0.00 |

2. *Life Membership Fund* ($6,500.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 357.48 |
| Transferred to Endowment Increment Fund | $ 71.50 | |
| Transferred to Annual Membership Account | 285.98 | 357.48 |
| | | $ 0.00 |

3. *George C. Brackett Library Fund* ($500.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Balance, January 1, 1930 | $ 6.21 | |
| Income 1930 | 27.48 | $ 33.69 |
| Expended | $ 16.19 | |
| Transferred to Endowment Increment Fund | 5.50 | 21.69 |
| Balance, December 31, 1930 | | $ 12.00 |

4. *Benjamin Stuart Gager Memorial Fund* ($13,417.20) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income, 1930 | $ 737.92 | |
| Transferred from Cary Library Fund | 86.54 | $ 824.46 |
| Expended | $ 676.88 | |
| Transferred to Endowment Increment Fund | 147.58 | 824.46 |
| | | $ 0.00 |

5. *Martha Woodward Stutzer Memorial Fund* (10,000.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Balance, January 1, 1930 | $ 459.81 | |
| Income 1930 | 550.00 | $ 1,009.81 |
| Expended | $ 411.69 | |
| Transferred to Endowment Increment Fund | 110.00 | 521.69 |
| Balance, December 31, 1930 | | $ 488.12 |

* Restricted funds are those limited, by terms of gift, bequest, or solicitation, to the scientific and educational work of the Garden.

6. *Mary Bates Spalding Fund* ($2,697.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Balance, January 1, 1930 | $ 17.04 | |
| Income 1930 | 148.32 | |
| Refund | 40.26 | $ 205.62 |
| Expended | $ 175.96 | |
| Transferred to Endowment Increment Fund | 29.66 | 205.62 |
| | | $ 0.00 |

7. *Special Account W.* ($243,149.27) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Balance, January 1, 1930 | $ 343.35 | |
| Income 1930 | 13,373.20 | $ 13,716.55 |
| Expended | $ 303.36 | |
| Transferred to Endowment Increment Fund | 2,674.64 | |
| Transferred to Special Contributions | 10,500.00 | 13,478.00 |
| Balance, December 31, 1930 | | $ 238.55 |

8. *A. Augustus Healy Bequest* ($9,798.31) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 538.88 |
| Transferred to Endowment Increment Fund | $ 107.78 | |
| Transferred to Special Contributions | 431.10 | 538.88 |
| | | $ 0.00 |

9. *Robert B. Woodward Bequest* ($25,000.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 1,375.00 |
| Transferred to Endowment Increment Fund | $ 275.00 | |
| Transferred to Special Contributions | 1,100.00 | 1,375.00 |
| | | $ 0.00 |

10. *Alfred T. White Memorial Tablet Fund* ($3,889.85) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 213.92 |
| Transferred to Endowment Increment Fund | $ 42.78 | |
| Transferred to Special Contributions | 171.14 | 213.92 |
| | | $ 0.00 |

11. *Brooklyn Institute Centennial Fund B. B. G. Share* ($30,000.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 1,650.00 |
| Transferred to Endowment Increment Fund | $ 330.00 | |
| Transferred to Special Contributions | 1,320.00 | 1,650.00 |
| | | $ 0.00 |

12. *John D. Rockefeller, Jr., Fund* ($250,000.00) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Balance, January 1, 1930 | $ 4,017.15 | |
| Income 1930 | 13,750.00 | $ 17,767.15 |
| Expended | $ 3,159.73 | |
| Transferred to Endowment Increment Fund | 2,750.00 | |
| Transferred to Special Contributions | 9,200.00 | |
| Transferred to Special Purposes (Miscel.) | 80.10 | 15,189.83 |
| Balance, December 31, 1930 | | $ 2,577.32 |

13. *Citizens Endowment Fund* ($253,929.26) *Restricted:*

| | | |
|---|---|---|
| Income Account: | | |
| Income 1930 | | $ 13,966.10 |
| Transferred to Endowment Increment Fund | $ 2,793.22 | |
| Transferred to Special Contributions | 11,172.88 | 13,966.10 |
| | | $ 0.00 |

14. *Sustaining Membership. Restricted:*

| | | |
|---|---|---|
| Balance, January 1, 1930 | $ 24.99 | |
| Received from dues | 499.83 | $ 524.82 |
| Transferred to Annual Membership Account | | 524.82 |
| | | $ 0.00 |

15. *Annual Membership. Restricted:*

| | | |
|---|---|---|
| Balance, January 1, 1930 | $ 2,589.12 | |
| Received from dues 1930 | 5,840.00 | |
| Transferred from Life Memb. Acct. | 285.98 | |
| Transferred from Sustaining Memb. Acct. | 524.82 | $ 9,239.92 |
| Expended | $ 5,470.11 | |
| Transferred to Special Contributions | 2,000.00 | 7,470.11 |
| Balance, December 31, 1930 | | $ 1,769.81 |

16. *Tuition and Sales. Restricted:*

| | | |
|---|---|---|
| Balance, January 1, 1930 | | $ 1,747.03 |
| Received 1930 | | |
| *a.* Tuitions | 2,461.95 | |
| *b.* Seed Packets | 7,402.75 | |
| *c.* Sales | 368.83 | |
| *d.* Miscellaneous | 6.76 | $ 11,987.32 |
| Expended | $ 4,291.10 | |
| Transferred to Endowment Increment Fund | 1,838.13 | |
| Transferred to Special Contributions | 2,000.00 | 8,129.23 |
| Balance, December 31, 1930 | | $ 3,858.09 |

17. *Botanic Garden Collections Fund 1930. Restricted:*

| | | |
|---|---|---|
| Balance, January 1, 1930 | $ 710.72 | |
| Received from Contributions | 6,539.00 | |
| Miscellaneous | 995.33 | $ 8,245.05 |
| Expended | $ 6,992.74 | |
| Transferred to Special Contributions | 1,065.80 | |
| Transferred to Special Purposes. (Various) | 32.80 | 8,091.34 |
| Balance, December 31, 1930 | | $ 153.71 |

18. *Special Fund (Brooklyn Institute General Endowment Income: Annual Allotment) Restricted:*

| | |
|---|---|
| Income Account: | |
| Income 1930 | $ 1,195.00 |
| Transferred to Special Contributions | 1,195.00 |
| | $ 0.00 |

19. *Cary Library Fund ($10,000.00—1/5 of Income to Brooklyn Botanic Garden) Restricted:*

| | | |
|---|---|---|
| Balance, January 1, 1930 | $ 14.59 | |
| Income Allotment 1930 | 110.00 | $ 124.59 |
| Expended | $ .05 | |
| Transferred to Endowment Increment Fund | 22.00 | |
| Transferred to Benjamin Stuart Gager Memorial Fund | 86.54 | 108.59 |
| Balance, December 31, 1930 | | $ 16.00 |

20. *Henry W. Healy Trust Fund ($247,421.17—¼ of Income to Brooklyn Botanic Garden) Restricted:*

| | | |
|---|---|---|
| Income 1930 | | $ 1,058.89 |
| Expended | $ 375.00 | |
| Transferred to Endowment Increment Fund | 211.78 | 586.78 |
| Balance, December 31, 1930 | | $ 472.11 |

| | | | |
|---|---|---|---|
| 21. *Special Purposes. Restricted by Terms of Gifts:* | | | |
| Balance, January 1, 1930 | | | $ 11,158.27 |
| Received (including transfers): | | | |
| *a.* Anonymous for Japanese Garden | | 2,000.00 | |
| *b.* Various for Japanese Iris Test Garden | | 2,731.15 | |
| *c.* Special Gifts for Children's Work | | 65.00 | |
| *d.* Conservatory Plaza Fountain | | 5,560.00 | |
| *e.* Jenkins Foot Bridge | | 1,500.00 | |
| *f.* Wild Flower Garden | | 1,750.00 | |
| *g.* Miscellaneous | | 25.00 | |
| *h.* Transf. from Collections Fund | | 32.80 | |
| *i.* Transf. from John D. Rockefeller, Jr., Fund | | 80.10 | $ 24,902.32 |
| Expended | | | 23,952.18 |
| Balance, December 31, 1930 | | | $ 950.14 |
| 22. *Plant Pathology Research Fund. Restricted:* | | | |
| Balance, January 1, 1930 | $ 920.93 | | |
| Income 1930 | 10,212.20 | | $ 11,133.13 |
| Expended | $ 1,429.75 | | |
| Transferred to Special Contributions | 5,930.00 | | 7,359.75 |
| Balance, December 31, 1930 | | | $ 3,773.38 |
| 23. *Special Contributions (for 1930 only). Restricted:* | | | |
| Balance, January 1, 1930 | $ 1,550.94 | | |
| Transferred from | | | |
| Endowment Fund Income Account | | 2,221.98 | |
| Special Account W. Income Account | | 10,500.00 | |
| A. Augustus Healy Bequest Income Account | | 431.10 | |
| R. B. Woodward Bequest Income Account | | 1,100.00 | |
| A. T. White Memorial Tablet Fund Inc. Account | | 171.14 | |
| Brooklyn Inst. Centennial Fund Inc. Account | | 1,320.00 | |
| J. D. Rockefeller, Jr., Fund Income Account | | 9,200.00 | |
| Citizens Endowment Fund Income Account | | 11,172.88 | |
| Annual Membership Account | | 2,000.00 | |
| Tuition and Sales | | 2,000.00 | |
| Collections Fund | | 1,065.80 | |
| Special Fund (Inst. General Endowment) | | 1,195.00 | |
| Plant Pathology Research Fund | | 5,930.00 | |
| Miscellaneous | | 133.50 | $ 49,992.34 |
| Expended | | | 49,174.32 |
| Balance, December 31, 1930 | | | $ 818.02 |

24. *Endowment Increment Fund* ($91,918.24) *Restricted:*

| | | |
|---|---|---|
| Transferred from other accounts 1930 | $ 11,965.07 | |
| Interest 1930 | 4,339.22 | $ 16,304.29 |
| Transferred to Principal | | 16,304.29 |
| | | $ 0.00 |

*Summary of Private Funds Accounts:*

| | | |
|---|---|---|
| Balances, January 1, 1930 | $ 23,560.15 | |
| Income 1930 | 104,300.45 | $127,860.60 |
| Expended | $ 96,429.06 | |
| Transferred to Endowment Increment Fund Principal | 16,304.29 | 112,733.35 |
| Balances, December 31, 1930 | | $ 15,127.25 |

## III. Summary of Total Maintenance Budget for 1930

*Income*

| | | |
|---|---|---|
| Tax Budget Appropriation 44.1% | $101,006.67 | |
| Private Funds Budget 55.9% | 127,860.60 | |
| Total | | $228,867.27 |
| Transferred to Endowment Increment Fund Principal | | 16,304.29 |
| *Available* | | $212,562.98 |

*Expended*

| | | | |
|---|---|---|---|
| Personal Service | | | |
| Tax Budget | $82,236.67 | | |
| Private Funds | 49,174.32 | | |
| Total | | $131,410.99 | |
| Other than Personal Service | | | |
| Tax Budget | $18,770.00 | | |
| Private Funds | 47,254.74 | | |
| Total | | $ 66,024.74 | $197,435.73 |
| Balance, December 31, 1930 | | | $ 15,127.25 |

Respectfully submitted,

DANIEL C. DOWNS,
*Secretary and Accountant.*

Note:—The above "Financial Statement" is a transcript of Brooklyn Botanic Garden accounts in the books of the Treasurer of the Brooklyn Institute of Arts and Sciences. The Treasurer's accounts are audited annually by a Public Accountant, and a separate audit of this "Financial Statement" is not made in order to save unnecessary expense.

G. Foster Smith,
*Treasurer.*

## IV. Tax Notes for Permanent Improvements

N.D.P. 212Q—Completion of improvement of Plaza of Brooklyn Botanic Garden, including construction of underground storage room for tools and bulbs. (Including Architects' Fees.)

| | | |
|---|---|---|
| *Appropriation* | | $ 21,000.00 |
| *Expended* | | |
| Architects' Fees | $ 1,160.79 | |
| Improvement Work | 15,477.20 | |
| Total | | $ 16,637.09 |
| Balance, December 31, 1930 | | $ 4,362.01 |

N.D.P. 212R—Completion of Metal Stacks in Library Rooms and Herbarium Cases and mezzanine floor in Herbarium Room, Brooklyn Botanic Garden.

| | | |
|---|---|---|
| *Appropriation* | | $ 9,425.00 |
| *Expended* | | |
| Erecting Stacks | $ 3,454.23 | |
| New Cabinets, etc. | 5,957.00 | |
| Total | | 9,411.23 |
| Balance, December 31, 1930 | | $ 13.77 |

N.D.P. 212T—General Improvement of Land, lying east of Mt. Prospect Reservoir fronting on Eastern Parkway, including Architects' Fees.

| | |
|---|---|
| Appropriation | $ 24,100.00 |

No expenditures during the year 1930.

Certified as correct,
Edward S. Ryan, *Chief Clerk,*
*Department of Parks, Borough of Brooklyn.*

# APPENDIX 1

## GIFTS RECEIVED DURING 1930

### Collections Fund

Anonymous
Miss E. Addie Austin
Mrs. Frank L. Babbott, Jr.
Mrs. Catherine W. Boardman
Mrs. Armin E. Brunn
Mrs. Paul Bucher
Mrs. Glentworth R. Butler
Mrs. Percy Chubb
Walter H. Crittenden
Mrs. John R. Delafield
Dugan Brothers
Otto Ebel
Miss Adele F. Emerson
Mrs. Lewis W. Francis
John W. Frothingham
Mrs. Herbert F. Gunnison
Mrs. A. Augustus Healy
Mrs. Robert E. Henry
Mr. and Mrs. James M. Hills
Mrs. William T. Hunter
Miss C. Julie M. Husson
Edward A. Ingraham
Mrs. P. Chalmers Jameson
Alfred W. Jenkins
Mrs. Thomas B. Littlejohn
Miss Hilda Loines
Mrs. William W. Marshall
Mrs. Edwin P. Maynard
Miss Julia J. Pierrepont
William A. Putnam
Mrs. William A. Putnam
Hon. William C. Redfield
Herbert S. Smith
Mrs. Seth Thayer Stewart
Miss Elise W. Stutzer
Herman Stutzer
Mrs. Herman Stutzer
Mrs. Jeremiah R. Van Brunt
"C. W."
Mrs. Alexander M. White
Allin White
Miss Frances E. White
Harold T. White
Miss Harriet H. White
Women of "76" chapter, D. A. R.
Miss Abigail Young

### Iris Project

*For Expedition to Japan*

| | |
|---|---|
| National Academy of Sciences, National Research Council | $1,000.00 |
| American Iris Society | 250.00 |
| T. A. Havemeyer | 100.00 |
| Mrs. Horation G. Lloyd | 100.00 |
| Miss Marion Roby Case | 50.00 |
| C. Lewis | 50.00 |
| Mrs. E. Paul du Pont | 25.00 |
| Miss Grace Sturtevant | 10.00 |
| Brooklyn Botanic Garden | 1,146.15 |
| | $2,731.15 |

*Plants*

Gifts of Plants for the Iris Project are listed on page 82.

## Japanese Garden

Anonymous ..... $2,000.00

## Conservatory Plaza Fountain

Alfred W. Jenkins ..... $5,560.00

## Jenkins Foot Bridge

Alfred W. Jenkins ..... $1,500.00

## Wild Flower Garden

Alfred W. Jenkins: For Gates and Fence ..... $1,750.00

## Special Gifts for Children's Work

| | |
|---|---|
| Mrs. Earl Maxwell ..... | $ 15.00 |
| Woman's Auxiliary of Brooklyn Botanic Garden ..... | 60.00 |
| | $ 75.00 |

## Miscellaneous

| | |
|---|---|
| Woman's Auxiliary of Brooklyn Botanic Garden and others .... | $ 25.00 |
| Woman's Auxiliary of Brooklyn Botanic Garden for Spring Inspection ..... | $ 16.00 |
| Miss Hilda Loines for Photographs ..... | 14.55 |

## Living Plants

Mrs. A. G. Allis, 1 *Agave.*
Miss Jean Badger, 1 *Philodendron.*
Bobbink and Atkins, 351 Roses.
The Conard-Pyle Co., 21 Roses.
Cottage Gardens Co., Inc., 7 *Rhododendron,* 1 *Kalmia.*
Mrs. J. L. Crolius, 117 plants collected in the Adirondacks.
Mr. James W. Cromwell, 3 *Salix speciosa,* 3 *Salix elegantissima,* 3 *Populus generosa.*
Mrs. G. W. Dubois, 4 *Celtis occidentalis.*
Mrs. Lewis W. Francis, 1 *Semele androgyna.*
Mrs. S. Gerwin, 6 *Gladiolus* "Camille."
Mr. Louis Herman, 1 Miami Cherry.
Mrs. Oscar R. Houston, 10 *Chrysanthemum* "Smith Advance."
Miss Bessie Matthews, 1 *Iris.*
Mrs. Regina Armstrong Niehaus, 10 Lilacs.

Jackson and Perkins Co., 22 Roses.
Mrs. C. M. Pratt, 1 *Cyphomandra betacea.*
Mr. E. C. Robbins, 5 *Epigaea repens.*
Dr. C. F. Saunders, 6 *Iris.*
Mr. A. Schlevogt, 1 *Rosa viridiflora.*
Mr. William Tricker, Inc., 20 *Nymphaea.*
Mrs. S. G. Whiton, 2 *Bryophyllum calycinum.*
Mr. A. E. Wohlert, 2 *Prunus* "Kofugen."
Mrs. T. B. Wood, 1 *Cypripedium acaule.*

## Seeds

Mrs. A. G. Allis (1)
Gardenside Nurseries Inc. (1)
Mr. John H. Haymaker (2)
Miss Hilda Loines (1)
Miss Maybelle E. Moore (8)
Mr. R. C. Pickering (1)
Miss Sara Bigelow Reid (1)
Mr. Frank J. Reppa (2)
Dr. L. B. Smith (13)

## Phanerogamic Herbarium

Mrs. George Stewart Brown, 10 specimens.
Mr. Charles C. Deam, 16 specimens.
Dr. J. A. Drushel, 40 specimens.
Miss Sara Bigelow Reid, 1 specimen.
Dr. John B. Todd, 1 specimen.
Dr. J. K. Underwood, 23 specimens.

## Cryptogamic Herbarium

Mr. Ernst Clayton, 7 specimens.

## Library

### Books

Adams, Mr. Henry S., Brooklyn, N. Y. ..... 5
Black, Hon. Loring M., Brooklyn, N. Y. ..... 1
Blatt, Miss Natalie, Brooklyn, N. Y. ..... 1
Brooklyn Chamber of Commerce ..... 2
Brooklyn Museum Library, Brooklyn. N. Y. ..... 6
Cabot, Dr. Irving L., Brooklyn, N. Y. ..... 1
Carnegie Institution of Washington, Washington, D. C. ..... 2
Committee on Municipal Affairs of Chiropean Club, Brooklyn, N. Y. .. 1
Francis, Mrs. Sarah D. C., Brooklyn, N. Y. ..... 1
Gager, Dr. C. Stuart, Brooklyn, N. Y. ..... 25
Gluckson, Mr. Herbert, Brooklyn, N. Y. ..... 1
Gundersen, Dr. Alfred, Brooklyn, N. Y. ..... 2

Indiana Department of Conservation, Indianapolis, Ind. ..... 1
James Madison High School, Biology Club, Brooklyn, N. Y. ..... 1
Kirk, Miss Isabel, Brooklyn, N. Y. ..... 1
Knowles, Mr. John H., London, Eng. ..... 1
Lemée, Dr. Albert, Brest, France ..... 1
Marshall, Mrs. William W., Brooklyn, N. Y. ..... 3
Maxwell Training School for Teachers, Senior Nature Study Class, 1928, Brooklyn N. Y. ..... 1
Municipal Reference Library, New York, N. Y. ..... 1
Naomitsu, Marquis, Tokyo, Japan ..... 1
Nebraska State Horticultural Society, Lincoln, Neb. ..... 6
New York State Conservation Department, Albany, N. Y. ..... 1
Okura, Baron Kishichiro, Tokyo, Japan ..... 2
Pack, Mr. Arthur Newton, Princeton, N. J. ..... 1
Parents' Association, Public School 217, Brooklyn, N. Y. ..... 2
Pennsylvania Horticultural Society, Philadelphia, Pa. ..... 1
Pond, Miss P. F., Brooklyn, N. Y. ..... 1
Pratt, Mr. Abram J., Brooklyn, N. Y. ..... 1
Purdy, Miss Maud H., Brooklyn, N. Y. ..... 1
Republica Dominicana, Estacion nacional agronomica y colegio de agricultura de Moca ..... 1
Rubió, Mr. Nicholas Ma., Barcelona, Spain ..... 2
Sargent, Miss Zelda, Brooklyn, N. Y. ..... 1
Shaw, Miss Ellen Eddy, Brooklyn, N. Y. ..... 1
Smalley, Mr. Melvin, Brooklyn, N. Y. ..... 1
Smith, Miss M. Helen, Brooklyn, N. Y. ..... 2
Smithsonian Institution, Bureau of American Ethnology, Washington, D. C. ..... 2
Svenson, Dr. Henry K., Brooklyn, N. Y. ..... 2
Tokyo, Public Office of the City of, Japan ..... 2
R. Orto Botanico, Torino, Italy ..... 1
Woman's Auxiliary of the Brooklyn Botanic Garden ..... 2

Total ..... 92

## Pamphlets

Bailey, Prof. L. H., Ithaca, N. Y. ..... 1
Bartlett, F. A., Tree Expert Company, Stamford, Conn. ..... 1
Benedict, Dr. Ralph C., Brooklyn, N. Y. ..... 5
Boeuf, Prof F., Tunis, Africa ..... 1
Borodin, Prof. D. N., Russian Agricultural Agency, New York, N. Y. 1
Botanisch Laboratorium, Utrecht, Netherlands ..... 1
Britton, Dr. N. L., New York Botanical Garden ..... 1
Brooklyn Children's Museum, Brooklyn, N. Y. ..... 1
Brooklyn Museum Library, Brooklyn, N. Y. ..... 9
Brooks, Dr. S. C., Berkeley, Cal. ..... 6

Canada Agricultural Department Library, Ottawa, Canada ..... 1
Carnegie Institution of Washington, Department of Genetics, Cold Spring Harbor, L. I. ..... 36
Cornell University, Ithaca, N. Y. ..... 9
Correns, Dr. Carl, Berlin, Germany ..... 4
Cramer, Dr. P. J. S., Buitenzorg, Java ..... 1
Durham, Mr. O. C., Indianapolis, Ind. ..... 1
English, Mr. Carl S., Portland, Ore. ..... 1
Erlanson, Miss E. W., University of Michigan, Ann Arbor, Mich. ... 2
Finn, Prof. Wladimir W., Kiew, Russia ..... 2
Gager, Dr. C. Stuart, Brooklyn, N. Y. ..... 123
Gager, Mrs. C. Stuart, Brooklyn, N. Y. ..... 1
Gaiser, Dr. L. O., Hamilton, Canada ..... 1
General Outdoor Advertising Company, New York, N. Y. ..... 1
Graves, Dr. Arthur H., Brooklyn, N. Y. ..... 2
Gray Herbarium, Harvard University, Cambridge, Mass. ..... 3
Grier, Mr. Norman M., Elizabethtown, Pa. ..... 1
Harper, Prof. Roland M., Athens, Ga. ..... 3
Hartnagel, Mr. C. A., Albany, N. Y. ..... 1
Higgins, Mr. J. E., Summit, Canal Zone ..... 1
Institut Central d'Hygiene, Belgrade, Serbia ..... 1
Janet, M. Charles, Beauvais, France ..... 1
Kenoyer, Dr. Leslie A., Kalamazoo, Mich. ..... 1
Knowles, Mr. John H., London, Eng. ..... 1
Lindsay, Mrs. L. Seton, Greenwich, Conn. ..... 1
Lloyd, Prof. F. E., Montreal, Canada ..... 5
Ludwigs, Dr. Karl, Berlin, Germany ..... 1
McCubbin, Mr. J. C., Los Angeles, Cal. ..... 1
Montemartini, Dr. Luigi, Pavia, Italy ..... 1
National Research Council, Washington, D. C. ..... 2
Niedoba, Dr. Theodor, Vienna, Austria ..... 1
R. Orto Botanico di Pisa, Italy ..... 4
Purdy, Miss Maud H., Brooklyn, N. Y. ..... 1
Quinn, Mr. Davis, New York, N. Y. ..... 2
Rijks Universiteit, Botanic Garden and Laboratory, Utrecht, Netherlands 2
Rockefeller Institute for Medical Research, New York, N. Y. ..... 29
Rothamsted Experimental Station, Harpenden, Eng. ..... 15
Rudenko, Dr. Thomas E., Kiew, Russia ..... 1
Rusby, Dr. Henry Hurd, Columbia University, New York, N. Y. .... 4
Salgues, Dr. René, Brignoles, France ..... 3
St. John, Dr. Harold, Honolulu, Hawaii ..... 4
Saunders, Miss Edith R., Cambridge, Eng. ..... 2
Shaw, Miss Ellen Eddy, Brooklyn, N. Y. ..... 2
Sirks, Dr. M. J., Wageningen, Holland ..... 3
Stevens, Dr. Neil E., Bureau of Plant Industry, Washington, D. C. .. 33
Stoll, Mr. Frank, Brooklyn N. Y. ..... 1

| | |
|---|---|
| Studhalter, Prof. Richard A., Lubbock, Texas | 1 |
| Svenson, Dr. Henry K., Brooklyn, N. Y. | 1 |
| Thommen, Dr. A. A., New York, N. Y. | 1 |
| U. S. S. R. Society for Cultural Relations with Foreign Countries Moscow, U. S. S. R. | 1 |
| Wayside Home School for Girls, Valley Stream, L. I | 1 |
| Youngken, Prof. Heber W., Boston, Mass. | 1 |
| Zillig, Dr. Herman, Berncastel-Cues/Mosel, Germany | 2 |
| Total | 351 |

## Parts of Publications

*(Exclusive of Government Documents)*

| | |
|---|---|
| Adams, Mr. John, Ottawa, Canada | 4 |
| American Eagle, Estero, Fla. | 14 |
| American Horticultural Society, Washington, D. C. | 2 |
| American Museum of Natural History, Department of Education, New York, N. Y. | 1 |
| Argentine, Ministry of Agriculture, Buenos Aires | 2 |
| Bailey, Prof. L. H., Ithaca, N. Y. | 3 |
| Benedict, Dr. Ralph C., Brooklyn, N. Y. | 2 |
| Brooklyn Museum Library, Brooklyn, N. Y. | 129 |
| Canadian Phytopathological Society | 1 |
| Carnegie Institution of Washington, Division of Plant Biology | 2 |
| City Gardens Club, New York, N. Y. | 1 |
| Colorado University, Boulder, Col. | 1 |
| Committee on the Relation of Electricity to Agriculture, Chicago, Ill. | 2 |
| Commonwealth Fund, New York, N. Y. | 1 |
| Davey Tree Expert Company, Kent, Ohio | 3 |
| Florida Entomological Society, Gainesville, Fla. | 2 |
| Free, Mr. Montague, Brooklyn, N. Y. | 7 |
| Gager, Dr. C. Stuart, Brooklyn, N. Y. | 98 |
| Imperial Bureau of Animal Genetics, Edinburgh, Scotland | 2 |
| International Educational Cinematographic Institute, Rome, Italy | 2 |
| Kenya Colony and Protectorate, Forestry Department, Africa | 1 |
| Liu, Prof. J. C., Peiping, China | 1 |
| Lloyd Library, Cincinnati, Ohio | 13 |
| Medical Society of the County of Kings, The Library, Brooklyn, N. Y. | 1 |
| Minnesota, University of, Department of Botany, Minneapolis, Minn. | 1 |
| Missouri, University of, Columbia, Mo. | 1 |
| Municipal Reference Library, New York, N. Y. | 2 |
| National Central University, Department of Botany, Nanking, China | 1 |
| National Plant, Flower and Fruit Guild, New York, N. Y. | 2 |
| National Research Council of Japan, Tokyo, Japan | 1 |
| New Jersey Dahlia Society, New Brunswick, N. J. | 2 |

| | |
|---|---|
| New Jersey State Horticultural Society, Trenton, N. J. | 1 |
| New York Academy of Sciences | 8 |
| Provincial Museum of Natural History, Victoria, B. C. | 1 |
| Queensland Provisional Forest Board, Australia | 1 |
| Rickett, Mr. H. W., University of Missouri, Columbia, Mo. | 1 |
| Rijks Herbarium, Leiden, Netherlands | 2 |
| Rockefeller Institute for Medical Research, New York, N. Y. | 4 |
| Rothamsted Experimental Station, Harpenden, Eng. | 1 |
| R. Sociedad Espanola de Historia Natural, Madrid, Spain | 2 |
| School Garden Association of New York | 4 |
| Societas Zoologica-Botanica Fennica Vanamo, Helsingfors, Finland | 1 |
| Taihoku Imperial University Library, Formosa, Japan | 1 |
| Taylor, Mr. Norman, Brooklyn, N. Y. | 7 |
| Texas Academy of Science, San Antonio, Texas | 1 |
| Third British Empire Forestry Conference, Canberra, Australia | 1 |
| Tohoku Imperial University, Sendai, Japan | 1 |
| Union College, Schenectady, N. Y. | 1 |
| Warsaw, l'Ecole superieure d'Agriculture | 1 |
| Wild Flower Preservation Society, Washington, D. C. | 5 |
| Yale University, School of Forestry, New Haven, Conn. | 4 |
| Total | 353 |

## Portraits and Photographs

| | |
|---|---|
| Averill, Miss Mary, New York, N. Y. | 1 |
| Bartlett, F. A., Tree Expert Company, Stamford, Conn. | 2 |
| Baur, Dr. Erwin, Muncheberg, Germany | 1 |
| Benedict, Dr. Ralph C., Brooklyn, N. Y. | 1 |
| Blum, Mr. Edward C., Brooklyn, N. Y. | 1 |
| Butler, Mrs. Glentworth R., Brooklyn, N. Y. | 1 |
| Caparn, Mr. Harold A., New York, N. Y. | 1 |
| Cary, Mrs. William H., Brooklyn, N. Y. | 1 |
| Cockayne, Dr. Leonard, Wellington, New Zealand | 1 |
| Crittenden, Mr. Walter C., Brooklyn, N. Y. | 1 |
| Free, Mr. Montague, Brooklyn, N. Y. | 1 |
| Gager, Dr. C. Stuart, Brooklyn, N. Y. | 6 |
| Graves, Dr. Arthur H., Brooklyn, N. Y. | 1 |
| Gundersen, Dr. Alfred, Brooklyn, N. Y. | 1 |
| Jenkins, Mr. Alfred W., Brooklyn, N. Y. | 1 |
| Knowles, Mr. John H., London, Eng. | 1 |
| Loines, Miss Hilda, Brooklyn, N. Y. | 1 |
| R. Orto Botanico di Padova, Italy | 5 |
| Pammel, Prof. L. H., Iowa State College, Ames, Iowa | 2 |
| Putnam, Mr. William A., Brooklyn, N. Y. | 1 |
| Reimer, Miss Margaret B., Brooklyn, N. Y. | 1 |

| | |
|---|---|
| Rixford, Dr. Gulian Pickering, San Francisco, Cal. | 1 |
| Rusby, Dr. Henry Hurd, Columbia University, New York, N. Y. | 1 |
| Scott, Dr. Dukinfield H., Basingstoke, Eng. | 1 |
| Shaw, Miss Ellen Eddy, Brooklyn, N. Y. | 1 |
| Vines, Prof. Sidney H., Langstone, Eng. | 1 |
| White, Mrs. Alexander M., Oyster Bay, L. I. | 1 |
| Total | 38 |

AUTOGRAPH LETTERS

| | |
|---|---|
| Gager, Dr. C. Stuart, Brooklyn, N. Y. | 2 |
| Vines, Prof. Sidney H., Langstone, Eng. | 1 |
| Total | 3 |

## For the Department of Elementary Instruction

Bartlett, Mr. H. Noble, Six outline maps of the children's gardens and borders.

Blatt, Miss Natalie, $1.00 for the children's club room.

Blum, Mr. Edward C., One vase for the children's club room.

Butler, Mrs. Glentworth R., One prize cup competed for by the girls in the outdoor garden. One flag with standard for the Boys' and Girls' Club. Two hanks of raw silk for the children's work.

Dorward, Miss Margaret M., One set of bird and animal paintings for the children's club room.

Elbert, Mr. William, One motion picture reel on the children's work at the Brooklyn Botanic Garden.

Flatbush Garden League (through Mrs. E. L. Carson), Prize book for the greatest improvement made by a first year child in the outdoor garden.

Francis, Mrs. Lewis W., $5.00 for books for the children's club room.

Garden Teachers' Association, One prize cup competed for by the boys in the outdoor garden.

Gluckson, Master Herbert, One book for the children's club room library.

Goodman, Mr. Bernard, $1.50 for the children's club room library.

Hyde, Mrs. Clarence R., One year's subscription to the Nature Magazine for the children's club room library.

Maxwell, Mrs. Earl C., $15 for the children's work.

Murray, Miss Virginia, $1.00 for the children's club room library.

Nash, Mrs. Edith, Specimens from the West Indies for classwork—allspice, nutmeg, cacao, starch from arrowroot.

Parents' Association of P. S. 217, $5.00 for the children's club room library.

Pond, Miss P. F., One book for the children's club room library.

Purdy, Miss Maud H., One book for the children's club room library.

Shaw, Miss Ellen Eddy, Three gold honor pins for honorable service in the outdoor garden.

Smalley, Master Melvin. One book for the children's club room library.
Smith, Miss M. Helen, $1.00 for the children's club room library.
Woman's Auxiliary of the Brooklyn Botanic Garden, $50.00 for the children's work. $10.00 for the children's club room library.

## Miscellaneous

Mr. A. A. Abrahams, 1 package of seeds of various palms.
Arnold Arboretum, 61 rose plants.
Dr. Nathan T. Beers, 2 photographic prints (building and lily pool, and detail of lilies).
Botanic Gardens, Victoria, Nigeria, Africa, 3 packages of seed.
Brooklyn Daily Eagle, 2 copies each of two photographs of Richard Young Gate.
Bureau of Science, Manila, Philippine Islands, 4 vols., "An Enumeration of Philippine Flowering Plants," Merrill.
Cambridge (England) Botanic Garden, 10 *Ephedra nebrodensis* plants.
Mrs. William H. Cary, 4 copies of *Bulletin* of Garden Club of America (Series III, 5, 12, 15, 21).
Children's Museum (Brooklyn), 1 *Ficus lyrata.*
Doubleday, Doran & Company, 1 book, "The Rose Manual."
Mr. William C. Eckman, 2 photographs of Fish Head Outlets on conservatory fountain.
Mrs. Edna Frank, 1 *Rosa viridiflora.*
Mr. Henry Hottinger, 4 photographs (2 of water lilies, 2 of daffodils in Brooklyn Botanic Garden).
Mrs. Frank Johnson, 1 colored photograph of Botanic Garden building and lily pool.
Mr. William Matthews, 1 pencil sketch of the Torii in Brooklyn Botanic Garden.
M. Marie-Victorin, 1 specimen *Botrychium minganese* (dried).
Mrs. Edith L. Nash, specimens of allspice, nutmeg, cacao, and arrowroot from West Indies.
National Park Service, 1 pamphlet, "Glaciers of Glacier National Park."
New York Times, 3 photographs of Dr. George M. Reed in Japan.
Mr. L. F. Schumacher, 1 baby alligator.
Sutton & Sons, 15 packets of seed of different types of *Brassica.*
Mr. V. C. Van Horn, 8 photographs made in Brooklyn Botanic Garden.
Mr. L. Zilver, 2 postcard photographs (1 of new fountain, 1 of White Memorial Tablet).

# APPENDIX 2

## PUBLICATIONS OF MEMBERS OF STAFF DURING 1930

**Benedict, Ralph C.**

Syllabi for High Schools: I. Personal hygiene, II. Home hygiene. In collaboration with Elizabeth T. Fitzpatrick and

Paul B. Mann. Reprinted from *Syllabi* adopted by Board of Superintendents, June 21, 1929.

Report of the editors for 1929. In collaboration with E. J. Winslow and C. A. Weatherby. *American Fern Journal* **20**: 34–36. January–March.

What ferns grow best in the house? *Jour. New York Bot. Gard.* **31**: 47–49. February.

The proposed six-year science sequence: In rebuttal. *Bulletin of High Points* **12**: 10–12. February.

Report of the Resident Investigator for 1929. *Brooklyn Bot. Gard. Record* **19**: 120–122. March.

Studies on the Variation of *Nephrolepsis* (Report of Progress). *Brooklyn Bot. Gard. Record* **19**: 68. March.

Lessons in apples. *Torreya* **30**: 40–45. March–April.

More or less laboratory work. In collaboration with George C. Wood, John A. Clark, and J. E. Whitsit. *Bulletin of High Points* **12**: 51–52. May.

Summary of the activities of the standing committee on science during 1929–1930. In collaboration with George C. Wood, John A. Clark, and J. E. Whitsit. *Bulletin of High Points* **12**: 52–54. May.

Some valuable science periodicals. In collaboration with George C. Wood, John A. Clark, and J. E. Whitsit. *Bulletin of High Points* **12**: 54–57. May.

A gift-horse for general science. *Bulletin of High Points* **12**: 28–31. June.

Plant wards of New York State. *Brooklyn Bot. Gard. Leaflets* **XVIII**[5]. June 4.

Cabbages in the classroom. *Brooklyn Bot. Gard. Leaflets* **XVIII**[7–8]. October 29.

Review. Curtis: A synthesis and an evaluation of the subject matter in general science. *Bulletin of High Points* **12**: 104–105. November.

Review. Presson: A new standard test in biology. *Bulletin of High Points* **12**: 105–107. November.

A laboratory lesson in variation. *Torreya* **30**: 145–153. November–December.

**Caparn, Harold A.**

Scientific and decorative principles in a botanical laboratory. *American Landscape Architect.* Pp. 12–16, 38–40. December.

**Foss, Calvin W.**

Report of the Librarian for 1929. *Brooklyn Bot. Gard. Record* **19**: 106–120. March.

**Free, Montague**

Nineteenth annual report of the Brooklyn Botanic Garden. Report of the Horticulturist. *Brooklyn Bot. Gard. Record* **19**: 100–106. March.

Spring Planting. *Brooklyn Bot. Gard. Leaflets* **XVIII**[1–2]. April 2.

Fertilizers for city gardens. *Brooklyn Bot. Gard. Leaflets* **XVIII**[3]. April 30.

The rose garden of the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Leaflets* **XVIII**[6]: 1–4. September 10.

**Gager, C. Stuart**

Address of Welcome. Fifth National Shade Tree Conference. Brooklyn Botanic Garden. February 7, 1929. *Proc. Ann. Meeting,* p. 5. February.

Aeration of tree roots: Theory. *Proc. Ann. Meeting, Fifth Nat. Shade Tree Conference,* pp. 26–27. February.

Annual report of the Brooklyn Botanic Garden, 1929. Report of the Director. *Brooklyn Bot. Gard. Record* **19**: 13–53. March.

Botanic Gardens. *Encyclopedia Britannica.* Thirteenth Edition.

Unveiling of tablet to Sir William and Sir Joseph Hooker. *Science* **72**: 238–239. September 5.

The late G. P. Rixford. *New York Times.* November 5.

**Graves, Arthur Harmount**

The comparative resistance of root and shoot of the American chestnut to the chestnut bark disease. *Proc. Ann. Meeting, Fifth Nat. Shade Tree Conference,* pp. 56–57. February.

The present status of the chestnut in North America. *Report of the 20th Annual Meeting Northern Nut Growers Assn.*, New York City, September 12, 13, 14, 1929, pp. 48–54.

Report of work in forest pathology for 1929. *Brooklyn Bot. Gard. Record* **19**: 62–67. March.

Report of the Curator of Public Instruction for 1929. *Brooklyn Bot. Gard. Record* **19**: 70–81. March.

Inwood Park, Manhattan. *Torreya* **30**: 117–129. October.

Forms and functions of roots. *Brooklyn Bot. Gard. Leaflets* **XVIII**[9 10]: 1–8. December.

47 newspaper articles relating to the Brooklyn Botanic Garden.

Eight Abstracts in *Biological Abstracts.*

## Gundersen, Alfred

Communication No. 11: Familiae et genera quorum usus est diversus. *Brooklyn Botanic Garden International Seed Exchange.* April, 1930.

The principal groups of fossil plants. *Brooklyn Bot. Gard. Leaflets* **XVIII**[4]. May 14.

Report of the Curator of Plants for 1929. *Brooklyn Bot. Gard. Record* **19**: 94–100. March.

Report of progress on research. (Various problems in Systematic Botany.) *Brooklyn Bot. Gard. Record* **19**: 67–68. March.

## Reed, George M.

A new method of producing and detecting sorghum hybrids. *Jour. Heredity* **21**: 132–144. March.

Beardless Iris Project. *Brooklyn Bot. Gard. Record* **19**: 60–62. March.

Plant Pathology. *Brooklyn Bot. Gard. Record* **19**: 55–60. March.

Specimens of cereals for high schools. *Brooklyn Bot. Gard. Record* **19**: 82–86. March.

Report on a trip to Japan and to the Northwestern United States. *Brooklyn Bot. Gard. Record* **19**: 257–268. November.

**Shaw, Ellen Eddy**

Soil, the garden's theater stage. *The Girl Scout Leader.* Vol. VII, No. 3, March.

Report of the Curator of Elementary Instruction. *Brooklyn Bot. Gard. Record* 19: 86–94. March.

Mary, Mary quite contrary. *The Americal Girl.* April.

The value of nature study in the life of a child. *Delineator.* May.

The Brooklyn Botanic Garden. *P. S. 217 School Publication.* June.

Nature study for teachers and children. *School Nature Study,* London. July.

The following articles appeared in the New York *Sun* on the dates indicated:

The soil. January 10.

Chemistry of the soil. January 17.

Plant foods. January 24.

Chemical fertilizers. January 31.

Seeds: what to order. February 8.

Starting seeds indoors. February 15.

The outdoor garden: how to plan it. February 22.

Transplanting seedlings and starting others. March 1.

Implements for the garden. March 8.

The rose garden. March 15.

Shrubs. March 22.

The perennial garden. March 29.

The lawn. April 5.

Planning the small vegetable garden. April 12.

The rock garden. April 19.

Planting the small flower garden. April 26.

Planting the small vegetable garden. May 3.

The water garden. May 10.

Dahlias, cannas, and gladiolus. May 17.

Climbing vines and creepers. May 24.

Garden pests. May 31.

Review of work done in the garden and setting out of tender seedlings. June 7.

Transplanting and cultivating. June 14.

Staking and tying. June 21.
Checking up on the flower garden. June 28.
Trimming climbing roses. July 5.
Checking up on the annual picking border. July 12.
Midsummer in the garden. July 19.
Ordering bulbs. July 26.
The iris garden. August 2.
Evergreens. August 9.
Planting midsummer blooming bulbs. August 16.
Starting seeds of perennials for early bloom. August 23.
Making cuttings. August 30.
Planting bulbs. September 6.
Taking in the house plants. September 13.
Fall shrub planting for early bloom. September 20.
Planting of callas, Easter lilies, and oxalis for winter and spring bloom. September 27.
Making and remaking the perennial border. October 4.
Late fall planting. October 11.
Fall treatment of land. October 18.
Hardwood cuttings. October 25.
Indoor window boxes. November 1.
Winter care of roots and bulbs. November 8.
Putting the garden to sleep. November 15.
Last call for planting. November 22.
Winter bouquets. November 29.
House plants in sickness and health. December 6.
Plants for the sun room. December 13.
Choosing plants for Christmas. December 20.
What shall I do with my Christmas plants? December 27.

**Svenson, H. K.**

Report on a botanical exploration trip to the Galapagos Islands. *Brooklyn Bot. Gard. Record* **19**: 269–284. November.
The vegetation of Indefatigable Island. *Bull. N. Y. Zool. Soc.* **33**: 163–172. July–August.

# APPENDIX 3

## TALKS, LECTURES, ADDRESSES, AND PAPERS GIVEN BY MEMBERS OF STAFF DURING 1930

### By the Director of the Garden:

January 17. *Biological foundations of conduct.* Reformed Dutch Church, Flatbush, Brooklyn.

February 6. *What are the aims of science?* Y. M. C. A., Central Branch, Brooklyn.

February 13. *Why the controversy between religion and science?* Y. M. C. A., Central Branch, Brooklyn.

February 20. *What is evolution?* Y. M. C. A., Central Branch, Brooklyn.

February 27. *Can the findings of science and religion be reconciled?* Y. M. C. A., Central Branch, Brooklyn.

March 16. *The aims and methods of science.* Y. W. C. A., Brooklyn.

April 24. *What the Botanic Garden means to Brooklyn.* St. Ann's Parish House, Brooklyn.

May 8. *The significance of the Brooklyn Children's Museum.* Presentation of gold medal to Miss Anna B. Gallup, Curator-in-Chief, Brooklyn Children's Museum. National Institute of Social Sciences. Hotel Roosevelt, Manhattan.

May 20. *Botany serving the public.* Men's Club. Reformed Dutch Church, Flatbush.

May 20. *Botanical literature.* New York Special Libraries Association. Brooklyn Botanic Garden.

August 13. *The educational work of the Brooklyn Botanic Garden.* Ninth International Horticultural Congress, London, England.

### By the Curator of Plant Pathology:

January 27. *Irises.* Riverside, Conn. Garden Club.

March 16. Faculty and students, Okuda Training School for Needlework. Tokyo.

April 20. Sakura-no-kai—Cherry Society of Japan. Tokyo.

May 2. Pan-Pacific Club of Japan. Tokyo.

May 18. Ike-bana Society. Tokyo.

June 14. Hanashobu Association. Horikiri.
July 4. Faculty and students, Nakano Koto Jogokko. Nakano, Tokyo.
July 7. Faculty and students, Imperial College of Agriculture and Forestry. Morioka.
October 18. *Experiments with sorghums.* New York Association of Biology Teachers. At the Garden.
November 18. *Examples of genetics.* Biology Class, Girls Commercial High School. At the Garden.

**By the Curator of Public Instruction:**

January 15. *The recent history and present status of the chestnut in North America.* Torrey Botanical Club, N. Y. Botanical Garden.
January 17. *Bacteria.* Special lecture to student nurses from Prospect Heights Hospital. At the Botanic Garden.
March 18. *Conservation and forestry.* Brooklyn Scoutmasters. Under auspices of Children's Museum. Girls' Commercial High School.
March 20. *Conservation.* Garden Club of Newark.
April 28. *The Brooklyn Botanic Garden.* Asharoken Garden Club of Northport, L. I. At the Garden.
May 8. *The evolution of plants.* Girls' Commercial High School class. At the Garden.
May 14. *Conservation of native plants.* Woman's Auxiliary, American Institute of Mining Engineers. Hotel Biltmore, N. Y.
May 21. *Suggestions for nature study for children.* Flatbush School children.
May 21. *The work of the Brooklyn Botanic Garden.* Parent-Teachers Association. Flatbush School.
May 28. *Trees of Iceland.* N. Y. Bird and Tree Club. American Museum of Natural History.
June 10. *Reminiscences.* Advanced Biology class. Boys High School.
June 21. *Trees and shrubs of Greater New York.* N. Y. Botanical Garden.
December 16. *The chestnut tree in North America.* Advanced Biology Club. Boys High School.

**By the Curator of Elementary Instruction:**

January 28. Graduation address. P. S. 140.
March 17. *Plant life.* Child Study Association.
April 3. *Children and gardens.* Kindergarten Mothers' Clubs of Brooklyn and Queens. At Maxwell Training School for Teachers.
April 7. *Changes in the Brooklyn Botanic Garden from 1913 to 1930.* Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.
May 2. *Arbor Day.* Two assemblies, P. S. 142.
May 2. *Arbor Day.* Two assemblies, P. S. 183.
May 6. *The value of gardening in the life of a child.* Gardening Exhibit, Abraham & Straus.
May 7. *Window boxes.* Gardening Exhibit, Abraham & Straus.
May 8. *The small backyard garden.* Gardening Exhibit, Abraham & Straus.
May 9. *Summer nature study for the child.* Gardening Exhibit, Abraham & Straus.
May 10. *The child's own little garden.* Gardening Exhibit, Abraham & Straus.
May 14. *Activities at the Brooklyn Botanic Garden.* Brooklyn Bureau of Charities. At the Garden.
May 14. *The children's work at the Brooklyn Botanic Garden.* Mothers' Club, P. S. 2. At the Garden.
May 15. *Plant propagation.* Woodmere Garden Club.
May 20. *The educational work of the Brooklyn Botanic Garden.* Cleveland Garden Club.
May 21. *Children's work at the Brooklyn Botanic Garden.* Mothers' Club, P. S. 129. At the Garden.
May 27. *Children's work at the Brooklyn Botanic Garden.* Brooklyn Section, New York Public School Kindergarten Association. At the Garden.
June 13. *What the Brooklyn Botanic Garden offers to the public.* Central Branch, Y. M. C. A.
July 23. *The garden in midsummer.* Community and Garden Clubs, Northport, L. I.
July 25. *Midsummer wild flowers.* Columbia Broadcasting

Station, New York City, for the Coordinating Council on Nature Activities.

October 4. *Children's garden work at the Brooklyn Botanic Garden.* Nature Study Class from New York University. At the Garden.

October 9. *House plants.* Mothers' Club, P. S. 76.

November 10. *House plants.* Business and Professional Woman's Club, St. Marks Methodist Episcopal Church.

November 18. *Children's work at the Brooklyn Botanic Garden.* Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.

December 6. *Children's activities at the Brooklyn Botanic Garden.* Alumni Association of Tufts College.

December 9. *Home nature study for children.* W. N. Y. C. Broadcasting Station, for the United Parents' Association and New York Principals' Association.

December 10. *House plants and how to grow them.* New York Horticultural Society.

December 16. *Christmas greens.* P. S. 235.

December 23. *Christmas greens.* P. S. 36.

**By the Curator of Plants:**

April 28. *Ornamental trees and shrubs.* Garden Club, Flushing, L. I.

May 14. *Spring wild flowers.* Garden Club, Saugerties, N. Y.

**By the Assistant Curator of Plants:**

February 25. *Edible wild plants.* Boy Scout Leaders, Girls' Commercial High School.

March 7. *Spring flowers of the Eastern states.* Brooklyn Art Guild and The Contemporary Club. Brooklyn Botanic Garden.

October 14. *Vegetation of the Galapagos and Cocos Islands.* Department of Botany, Brooklyn Institute of Arts and Sciences. Brooklyn Botanic Garden.

**By the Horticulturist:**

March 5. *Beautiful Gardens.* Dutchess County Horticultural Society.

March 18. *English Gardens.* Reformed Protestant Dutch Church, Flatbush.

April 28. *Rock Gardens.* Long Island Division of the Federated Garden Clubs of New York State, at the Garden.

September 2. *Gardening in General.* Westhampton and Quogue Garden Club.

September 11. *The Work of Municipal Rose Gardens.* American Rose Society Meeting, in Atlantic City, N. J.

October 5. *Beautiful Gardens.* Jackson Heights Garden Club.

November 15. *Rock Gardens.* East Flatbush Garden Club.

December 6. *Herbaceous Perennials.* New York Botanical Garden.

**By the Resident Investigator:**

February 16. *Creating new plants.* Sunday Night Club of Flatbush Congregational Church, Brooklyn.

April 26. *Creating new plants—Exploding a myth.* Saturday Night Club, Brooklyn.

May 10. *Native ferns.* New York Association of Biology Teachers.

May 15. *Eugenics: A biologist looks into the future.* American Museum of Natural History.

October 18. *Varieties of cabbages.* New York Association of Biology Teachers. At the Garden.

November 6. *The problem of finding new plants: The story of modern plant breeding.* American Museum of Natural History.

**By Instructors and Others:**

*Miss Dorward:*

May 26. *The planning and care of backyard gardens.* Kingslawn Community Church.

*Mrs. MacColl:*

March 20. *House plants.* Mothers' Club, P. S. 105.

May 6. *The work of the Brooklyn Botanic Garden.* Mothers' Club, P. S. 134. At the Garden.

May 10. *How to make blue prints.* Gardening Exhibit, Abraham & Straus.

June 20. *Opportunities offered by the Brooklyn Botanic Garden.* P. S. 180.

*Miss Sargent:*

March 13. *Spring flowers.* Fourth Unitarian Church.
March 18. *The educational value of gardening for children.* Parents' Association, P. S. 208.
April 3. *The children's garden at the Brooklyn Botanic Garden.* George Washington School, White Plains.
April 7. *The children's garden at the Brooklyn Home for Consumptives.* Woman's Auxiliary of the Brooklyn Botanic Garden. At the Garden.

*Miss Sutcliffe:*

January 25. *The care of house plants.* Garden Club of East Flatbush Community Center.

**By the Research Assistant (L. Gordon Utter):**

March 10, March 27. *Plant breeding.* Biology class, Girls' Commercial High School. At the Garden.
May 14, May 21. Plant breeding. Biology class, Thomas Jefferson High School. At the Garden.

## APPENDIX 4

### REPORT ON BROOKLYN BOTANIC GARDEN PUBLICATIONS, 1930

*American Journal of Botany*

Official Organ of the Botanical Society of America

Volume XVII (1930) comprised, as usual, ten monthly issues (omitting August and September), with 70 papers, 1065 pages, 63 plates, and 241 text figures (as against 66 papers, 881 pages, 79 plates, and 154 text figures in 1929). Twelve papers were published on the "author payment" plan. Dr. Arthur Harmount Graves continued on the editorial board as representative of the Garden. Dr. Edmund W. Sinnott, of Columbia University, continued as Editor-in-Chief.

The circulation at the close of the fiscal year (November 29,

1930) was 1673 as against 1622 one year ago. The annual budget was $19,0733.51 against $15,807.77 in 1929. The year closed with a credit balance of $2578.88 and assets over liabilities of $6515.19, plus the value of back sets and volumes on hand.

## *Ecology*

Official Organ of the Ecological Society of America

Quarterly. Volume XII comprised 52 papers (besides reviews, proceedings, and miscellaneous matter), 797 pages, 20 plates, and 177 text figures (as against 38 papers, 563 pages, 61 plates, and 36 text figures in 1929). The circulation at the close of the fiscal year (November 30, 1930) was 1095 as against 1048 one year ago. The annual budget was $6486.31, the credit balance $204.00, and assets over liabilities $146.73 (against $5946.39, $1060.73, and $698.66 in 1929) plus back sets and volumes on hand. Mr. Barrington Moore, Washington, D. C., continued as Editor-in-Chief. With the January 1930 issue Dr. Alfred Gundersen became the Botanic Garden representative on the editorial board.

## *Genetics*

In Cooperation with the Editorial Board of Genetics

Bimonthly. Volume XV comprised 18 papers, 589 pages, 7 plates, and 67 text figures (as against 23 papers, 644 pages, 19 plates, and 62 text figures in 1929). At the close of the fiscal year (November 30, 1930) the circulation was 680, the annual budget $5916.53, the credit balance $459.26, and assets over liabilities $676.63 (as against 623, $5957.63, $640.70, and $254.80 in 1929). Dr. Donald F. Jones, Connecticut Agricultural College, continued as Editor-in-Chief.

## *Brooklyn Botanic Garden Record*

Bimonthly. Volume XIX (1930) comprised 289 pages. As usual, the March number comprised the Annual Report. The May number, entitled *Views in Brooklyn Botanic Garden, 1930–1935,* was devoted to illustrations of architect's and landscape architect's plans of features needed in the Garden, which might be provided

by gifts of private funds or by city appropriations. Since this issue was published the following features have been completed as the result of gifts: Conservatory Plaza Fountain, Entrances to Native Wild Flower Garden, Foot Bridge over the Brook near the outlet of the Lake. Funds for one new Garden Seat have also been pledged, and the city has made appropriation for the development of the North Addition. The July number was Guide No. 4, *The Japanese Garden of the Brooklyn Botanic Garden.* The circulation of the RECORD at the close of the year was 1608 copies.

### *Leaflets*

Three single numbers and four double numbers were issued. Number 6 (September 10) was a brief description of the Rose Garden. The circulation as of December was 1930 copies.

### *Contributions and Memoirs*

Numbers 57 and 58 of the *Contributions* were published. No *Memoir* was issued.

## APPENDIX 5

### FIELD TRIPS CONDUCTED 1930

**By the Director:**

May 3. Torrey Botanical Club. Brooklyn Botanic Garden.

**By the Curator of Public Instruction:**

May 31. Department of Botany, Department of Education, Brooklyn Institute of Arts and Sciences, Kreischerville, Staten Island, to see stand of *Pinus virginiana.*

September 13. Torrey Botanical Club. Fresh Kills, Staten Island.

**By the Curator of Plants:**

May 3. Torrey Botanical Club. Brooklyn Botanic Garden.

May 10. Brooklyn Institute of Arts and Sciences, Department of Botany, Hollis, L. I.

**By the Assistant Curator of Plants:**

February 9. Torrey Botanical Club. Pleasant Plains, Staten Island. Winter Trip.

## APPENDIX 6

### MEETINGS OF ORGANIZATIONS AT THE GARDEN
### 1930

March 10. Contemporary Club, Brooklyn Art Club, and Valley Garden Club.
April 7. Womans' Auxiliary of Brooklyn Botanic Garden.
April 28. Conservation Committee of Long Island Division of Federated Garden Clubs of New York State.
April 28. Asherokan Garden Club.
April 29. Columbia Dames.
May 4. New York League of Mothers' Clubs.
May 6. Mothers' Club, P. S. 134.
May 6. Torrey Botanical Club.
May 7. Women of '76 Chapter, N. S. D. A. R.
May 14. Heads of Department Association, Borough of Brooklyn.
May 14. North Country Garden Club.
May 14. Brooklyn Bureau of Charities.
May 14. Mothers' Club, P. S 2.
May 20. Special Libraries Association of New York.
May 21. Nutley Garden Club.
May 23. Brooklyn Federation of Community Centers.
May 27. Kindergarten Teachers' Association.
June 3. Garden Committee of Plandome Women's Club.
October 14. Department of Botany, Brooklyn Institute.
October 20. Garden Department, Garden City—Hempstead Community Club.
November 8. National Recreation Association.

| | |
|---|---|
| Number of Organizations | 23 |
| Total attendance | 813 |

## APPENDIX 7

### REPORT ON PHOTOGRAPHIC WORK

| | |
|---|---|
| Negatives on file December 31, 1929 | 6,850 |
| Negatives accessioned during 1930 | 150 |
| Total negatives on file December 31, 1930 | 7,000 |

| | |
|---|---|
| Lantern slides on file December 31, 1929 | 5,370 |
| Lantern slides accessioned during 1930 | 80 |
| Total lantern slides on file December 31, 1930 | 5,450 |
| Prints on file December 31, 1929 | 3,226 |
| Prints made during 1930 | 2,067 |
| Used or distributed | 1,917 |
| Prints filed during 1930 | 150 |
| Total prints on file December 31, 1930 | 3,376 |
| Enlargements made | 102 |

Respectfully submitted,

FRANK STOLL,
*Registrar.*

## APPENDIX 8

## AGREEMENT BETWEEN BROOKLYN BOTANIC GARDEN AND THE AMERICAN FERN SOCIETY

### CONCERNING THE DEPOSITION OF THE LIBRARY OF THE FERN SOCIETY AT THE BOTANIC GARDEN

WHEREAS, the American Fern Seciety wishes to make the contents of its library readily accessible to all students of ferns; and

WHEREAS, the Brooklyn Botanic Garden desires to cooperate in this object; and

WHEREAS, Dr. Ralph C. Benedict, Resident Investigator at the Botanic Garden, is an officer of the Fern Society, as Editor of the *American Fern Journal,* official organ of the Society, the over copies of which are now deposited at the Brooklyn Botanic Garden in accordance with the terms of an *Agreement* between the Society and the Botanic Garden, date January 15, 1927;

It is hereby mutually agreed as follows:

1. The American Fern Society will deposit its library, comprising books, pamphlets, and periodicals received by it in exchange for the *American Fern Journal* or otherwise, at the Brooklyn Botanic Garden, and the Botanic Garden will receive the same, and subsequent additions to the collection initially transferred, for deposit on the shelves of the Botanic Garden Library.

2. At the time of sending its library to the Botanic Garden, the Society will give the Garden, in duplicate, a full and complete list of every publication which it sends, and the Garden will sign and return one copy of this list as acknowledgment for what it receives.

3. The Society's library is to be administered as a reference library under the same regulations that govern the Botanic Garden Library as a whole, and shall be freely accessible to the Society's members, to the staff of the Botanic Garden, and to the general public, in harmony with such regulations as may be in force or adopted from time to time by the Botanic Garden authorities, concerning hours and days of opening and closing the Laboratory Building of the Garden, and access thereto and to its various rooms.

4. *a* The publications belonging to the Society's Library will not be available for use outside the Laboratory Building except by loan to some other library, scientific institution, or school, or to the Fern Society through its officially designated representatives.

*b* In general, all loans are to be for a period not to exceed two weeks, unless special arrangement for renewal is mutually agreed upon by the Botanic Garden and the borrower.

*c* The borrower shall pay all costs of transportation both ways, including sufficient insurance to represent replacement value of the publication.

5. The Botanic Garden agrees to give to the books and other publications of the Society, deposited with it, similar supervision to that given to its own Library, and the Society hereby absolves the Botanic Garden from all responsibility for loss or damage to said deposited books and other publications from any cause whatsoever.

6. The books and other publications deposited are to remain the property of the American Fern Society.

7. Either party will give the other not less than one year's notice of its desire and intention to terminate and cancel this agreement.

8. The American Fern Society will remove all of the publications constituting its library and all records and papers related thereto from the Laboratory Building and property of the Brooklyn Botanic Garden within not less than one year after notice from

the Botanic Garden of its desire to terminate and cancel this agreement, and the Botanic Garden will permit the removal of said publications and records within one year of notice from the American Fern Society of its desire to remove them and cancel this agreement.

For the Brooklyn Botanic Garden
(Signed) C. Stuart Gager,
*Director.*

For the American Fern Society
(Signed) William R. Maxon,
*President.*

Brooklyn, New York
April 21, 1930.

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*(Revised to February 25, 1931)*

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| Through the Botanic Garden | 20 | |
| Through Other Departments | 252 | 272 |
| Sustaining Members | | |
| Through the Botanic Garden | 24 | |
| Through Other Departments | 44 | 68 |
| Annual Members | | 627 |
| Total | | 1,113 |

# THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about $300,000) and of other permanent improvements (about $253,00) has been met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms of the annual appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden to purchase all books for the library, all specimens for the herbarium, all lantern slides, and numerous other items, and to pay certain salaries, with private funds.

*The urgent needs of the Garden for private funds for all purposes, are more than twice as great as the present income from endowment, membership dues, and special contributions.* The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.*

* A written *Argeement*, dated August 17, 1914, between the City of New York and the Institute, touching the Botanic Garden, published in full in the *Brooklyn Botanic Garden Record*, for April, 1915, amends the agreement of September 9, 1912, which amends the original agreement of September 28, 1909, published in the *Record* for January, 1912.

# INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

| | |
|---|---|
| 1. Annual member | $ 10 |
| 2. Sustaining member | 25 |
| 3. Life member | 500 |
| 4. Permanent member | 2,500 |
| 5. Donor | 10,000 |
| 6. Patron | 25,000 |
| 7. Benefactor | 100,000 |

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through coöperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, 6173 Prospect.

# PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party, when visiting the Garden.
4. Admission of member and his or her immediate family to all lectures, classes, field trips, and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Invitations to spring and fall "Flower Days."
6. Special lectures and classes for the children of members.
7. Copies of Garden publications, as follows:

    *a*. Record.
    *b*. Guides.
    *c*. Leaflets.
    *d*. Contributions.

8. Frequent Announcement Cards concerning plants in flower and other exhibits.
9. Privileges of the Library and Herbarium.
10. Expert advice on the choice and care of plants, indoors and out, on planting the home grounds, the care of lawns, and the treatment of plants affected by insect and fungous pests.
11. Identification of botanical specimens.
12. Participation in the periodical distribution of duplicate plant material and seeds, in accordance with special announcements sent to members from time to time.

# FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

## Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which said sum to be used for the educational and scientific work of the Brooklyn Botanic Garden.

## Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

## Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as the

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## Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, to be used (or the income from which to be used) for the Brooklyn Botanic Garden*

.....

.....

*The following additional purposes are suggested for which endowment is needed.

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustrations for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.

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# GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

* Resigned December 11, 1930, to take effect May 14, 1931.

# PUBLICATIONS

OF THE

# BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.50 a year, 25 cents a number. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

*55. Physiologic races of bunt of wheat.* 14 pages. 1928.

*56. The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

*57. New physiologic races of oat smuts.* 22 pages. 1930.

*58. A new method of producing and detecting sorghum hybrids.* 12 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record;* see above.

*Guide No. 3. The story of our metate: A chronicle of corn.* Illustrated. Published, December, 1929. (Brooklyn Bot. Gard. Record, **18**[6]: 283–307.) Price, 25 cents.

*Guide No. 4. The Japanese Garden of the Brooklyn Botanic Garden.* Illustrated. Published, July, 1930. (Brooklyn Bot. Gard. Record, **19**[4]: 197–234.) Price, 25 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 143 botanic gardens and institutions located in 42 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

# BROOKLYN BOTANIC GARDEN RECORD

VOL. XX MAY, 1931 NO. 3


## THE ROCK GARDEN

OF THE

## BROOKLYN BOTANIC GARDEN

GUIDE NO. 5

PUBLISHED QUARTERLY
AT PRINCE AND LEMON STREETS, LANCASTER, PA.
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BROOKLYN, N. Y.

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FIG. 1. Rock Garden. East side. View facing northeast. *Iberis sempervirens* and *Statice Armeria* in foreground.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XX MAY, 1931 NO. 3

# THE ROCK GARDEN OF THE BROOKLYN BOTANIC GARDEN [1]

By Montague Free

Rock gardening is a branch of ornamental horticulture that has long been popular in Europe, more especially in the British Isles. Of late years it has made rapid strides in the favor of garden lovers in North America.

The Rock Garden of the Brooklyn Botanic Garden was constructed in the spring of 1916. It is believed that this was the first rock garden of any considerable size to be constructed in a public garden or park in the United States. The rocks used in its construction are, for the most part, glacial boulders which were uncovered in the course of grading operations on other parts of the grounds. These boulders are very unprepossessing material for the construction of a rock garden, their rounded contours almost prohibiting any natural and artistic effects from being obtained. Their hard, impervious surfaces are far from ideal from the standpoint of the cultural requirements of the alpine plants, which revel in rocks of a rough, porous nature that will hold moisture and to which their roots may cling. In spite of these disadvantages, one is cheered by over-hearing visitors commenting on the "wildness" and natural appearance of the garden. In order to provide quarters for plants that delight in rock crevices, a number of the larger boulders were split and the fissures filled with suitable soil. The fact that in 1918 over six hundred species and varieties were growing in the garden, many of them alpines considered very intractable in this part of the country, is testimony that the difficulties of cultivation have, in part, been overcome. The number of species represented today is

[1] Plant nomenclature in this guide is based, as far as is possible, on *Hortus,* by L. H. Bailey and Ethel Zoe Bailey. The Macmillan Co., 1930.

almost eight hundred in spite of losses due to vandalism, carelessness on the part of visitors, and lack of adaptability to our conditions on the part of some of the alpines.

What is called a "moraine garden" was constructed in 1917 to care for some of the more capricious alpines. It was made by excavating the soil over a small area of the rock garden to a depth of eighteen inches or two feet, and replacing it with a mixture of three-quarter inch crushed stone, five parts; sand, one part; and leaf mould, one part. This sounds like a hungry and unpromising mixture for plant culture but it provides perfect drainage, and encourages the roots to penetrate deeply where it is cool and moist, a most important point in the cultivation of alpines. It also insures perfect ripening of the top growth, enabling the plants better to withstand the vagaries of our winters. Among the subjects planted in the moraine are the more difficult species of *Androsace, Saxifraga, Primula,* and *Asperula.* Their growth was so encouraging that in the fall of 1922 a further area was excavated, more than trebling the size of the moraine.

The Rock Garden was further extended in 1921 by construction on the east side of the main walk.

The general idea in making the garden was that of representing a boulder-strewn slope. This design, of necessity, was modified in places to provide proper cultural conditions as to drainage, depth of soil, and shade. The desirability of walks or trails, so that visitors might get near enough to the plants to appreciate their beauty, was another factor which prevented the idea of a boulder-strewn slope being carried out in its entirety. The provision of adequate facilities for viewing the plants in a rock garden which is open to the public is always a problem when a naturalistic effect is desired. If the walks and trails are constructed of rocks similar in character to those used in the body of the garden, and made without definite boundaries so as to merge into the garden, many plants are doomed to destruction by the feet of visitors.

As it was decided that easy accessibility to the plants was of greater importance than maintaining intact the idea of a stony slope, our garden is well provided with walks and trails. These are made of broken flagstones, laid informally, and, in the case of the small trails, with a stepping-stone effect. There is very

FIG. 2. Rock Garden looking north. (2582)

little excuse for deserting the walks for the purpose of inspecting the plants.

As the rock garden is intended primarily to supply proper cultural conditions and to display in a suitable setting alpine and saxatile plants, it may well be considered as an ecological exhibit. With this in mind, the garden was located opposite and adjacent to the Ecological Section, in point of fact being a part of and tying up with latter feature. The desirability of making the rock

FIG. 3. *Alyssum saxatile, Thymus Serpyllum, Achillea ageratifolia.* (3232)

garden an adjunct to the Ecological Section resulted in a general easterly exposure which is not considered ideal from the gardening standpoint, because of the lack of shade for the plants that object to full sunshine. This disadvantage has been overcome by saving a few small trees that happened to be on the site and by disposing the larger boulders so that they cast some shade.

Rock Gardens, as we know them, undoubtedly originated in order to provide proper cultural conditions and suitable settings

for the plants of the high mountains. These aristocrats of the mountain tops need special treatment in order to enable them to thrive under cultivation in lowland regions of the temperate zone and this can best be provided in a rock garden. The thing to remember in the construction of an alpine and rock garden is that the majority of these plants require a soil that is gritty and well drained, for most of them resent stagnant water at the roots. In making a rock garden, therefore, one should provide perfect drainage and a sandy, porous soil to be used in filling in the spaces between the rocks. When a soil of this kind is used, it is easy by the addition of crushed limestone, bluestone screenings, peat, or humus, as the case may be, to modify the soil in such a way as to make it suitable for the more pernickety plants.

Mr. Clarence Lown, dean of rock gardeners of the United States whose recent demise (1931) was a great loss to our horticulture, had great success in growing alpine plants, and in his garden at Poughkeepsie had the choicest collection in the country. Mr. Lown has said:

"If ordinary soil is used in the rock garden and no especial pains are taken as to drainage, many of these plants will do beautifully in the early months and the gardener will be delighted with the ease with which they may be grown. But this is somewhat in the nature of a false triumph and a different story is told when real summer comes. The heat is bad enough and if the weather be dry, watering is to be done at evening; then the plants will be fairly comfortable. But it is when we have a spell of hard showers, with heat and humidity that these same plants suffer. The ground remains soaked around the crown and the leaves do not dry off quickly enough and the result is the damping of some choice plants. The porous soil advised will in great measure prevent this by giving quick drainage.

"A great many of the plants suitable for growing in rockeries will not require any special soil mixture, but all or nearly all will grow well in it and, to assure better success, it is advised that the soil mixture be approximately as follows:

3 parts good loam from rotted sods, 1 part sharp sand.
2 parts humus. I use swamp muck that has been exposed to weather for two years and become fine. When freshly

FIG. 4. Rock Garden in fall, view facing northwest. Flagstone trail interplanted with *Mazus reptans*. (2585)

dug, it is lumpy and sour. Wood soil would probably be better but that would be hard to get in sufficient quantity.

2 parts crushed stone, such as is used for finishing roads, or fine gravel.

½ part crushed limestone or old mortar; as most rock plants like lime or do not object to it.

"This mixture should be not less than 14 inches deep, the deeper the better. This makes a porous soil giving quick drainage, and enabling the plant to root more deeply than it would in a stiffer soil, and so withstanding drought better. The stone in it aids in keeping the soil cool.

"Do not forget to give a top dressing of crushed stone or fine gravel around the plants. This serves to keep the crown from getting waterlogged and also keeps the surface of the ground cool.

"This mixture is as good as any for a foundation soil and agrees with most of the plants, but, of course, no one stated mixture can be expected to serve for all. Some, the Encrusted Saxifragas, for example, like much more grit; and some like more humus, especially any that grow naturally in woods or partly shaded places."

The purpose the rocks serve in a rock garden is that of giving shelter, conserving moisture by preventing evaporation from the surface, and helping to keep the ground cool.

In placing the rocks one can be guided by the views of those who assume that the plants which the rock garden contains are all important and that the arrangement of rocks is of little consequence, except in so far as it contributes towards the well-being of the plants; or, one may take the point of view, which is perhaps the better one, that the arrangement of the rocks should be as natural, as pleasing, and as artistic as possible, consistent with providing suitable accommodations for the plants that the garden is to contain. Anyone contemplating the construction of a rock garden would be well advised to study rock arrangement as it occurs in Nature and be guided, in part at least, by Nature's methods.

It is desirable that the finished product should in itself look natural, and essential that it be in harmonious relation with its surroundings.

FIG. 5. Rock Garden after an ice storm. (6119)

The forms that rock gardens take are, like Cleopatra, of "infinite variety." They range from the many "pocketed" construction, designed to accommodate a large collection of alpines, to the "moorland" garden consisting merely of an outcrop of rocks furnished with a few species, only, of heaths and similar plants.

FIG. 6. Alpines planted in bowl for table decoration—*Mazus reptans, Androsace carnea* var. *brigantiaca, Primula acaulis* var. The tall primrose in the rear is *Primula Kewensis* which is not hardy. (5082).

To the best of my recollection every book that I have read dealing with rock gardens, every article on rock garden construction, and every nurseryman's catalog that gives hints on rock garden making, is insistent that the rocks should be so placed that rain is conducted towards the roots of the plants. In other words, don't place the rocks as though you were laying shingles on a roof, but tilt them so that the water is conducted towards

the soil of the rock garden. In the case of almost vertical construction avoid overhanging rocks, but instead build with a batter, recessing the rocks slightly as you build, taking care that the upper surface of each stone slopes down and inward.

When stratified rocks are used, it is desirable so to place them that the lines of stratification are uniform throughout, though not necessarily horizontal. It is true that in nature one often finds the stratification considerably confused and jumbled due to geologic upheavals, but is is difficult to make such a style of construction look convincing in an artificial rock garden.

One of the most satisfactory kinds of rock gardens is that made in the form of a winding ravine. A garden constructed on these lines gives every aspect—a desideratum when dealing with difficult plants. A very good illustration of this type is to be found in the Hanbury Garden at Brockhurst in Sussex, England. Here a large part of the garden was made by excavating in sandstone rock, thus forming a deep ravine with almost vertical sides, the crevices in the rocks afterwards being filled with suitable soil and planted. The rock obtained in excavating was used to extend the garden.

Of an entirely different type is the rock garden at Friar Park, Henley-on-Thames, the country estate of the late Sir Frank Crisp. This is one of the largest and most pretentious rock gardens in existence covering, as it does, several acres of ground. Over 7,000 tons of rock were used in its construction and many of the pieces weigh up to 12 tons. This garden is of the mound type and a feature in it is a replica, made to scale, of the peak of the Matterhorn.

Other developments of the rock garden idea in gardens may be seen exemplified in the garden of Childerly Hall in Cambridgeshire, England, where there is a pleasing rock arrangement of the flat type, the planting associated with it being of the herbaceous perennial order, as well as the plants that one usually associates with the rock garden.

The late Reginald A. Malby constructed a fascinating and unique rock garden in his London back yard on a plot of 30 × 70 feet. This garden is unique in that the "rocks" used are pieces of concrete obtained from a demolished road. These irregular

FIG. 7. Alberta Dwarf Spruce (*Picea glauca* var. *conica*, sometimes sold erroneously as *P. Albertiana*) and *Campanula rotundifolia* var. *Hostii*. (6346)

lumps of concrete were treated with an iron salt to soften their harsh and forbidding color. On this small area, Mr. Malby, in addition to growing a respectable collection of alpines, had a pool and a bog garden. A full account of this interesting garden may be found in *The Story of My Rock Garden,* by Reginald A. Malby.

Mr. Clarence Lown, at Poughkeepsie, created a rock garden of which any country might be proud. In his garden, Mr. Lown did not attempt any pretentious landscape features. The garden on the whole consists of flat rocky beds, yet it is charming and restful and, as previously mentioned, contains an amazingly good collection of alpine and rock plants.

Mr. and Mrs. Walter Beck have made a delightful and artistic rock garden at Millbrook, New York, by adapting a steep slope overlooking a lake to the needs of a rock garden and by constructing rock work on the upper levels. In this garden, alpine, rock, woodland, and bog plants grow in happy profusion. The beauty of the garden is further enhanced by the lavish use of water in the form of rivulets and pools. This may serve as an example of a rock garden partly natural, partly artificial, part of it in the open (a necessity, if alpines are to be grown), and part in woodland.

In many gardens advantage has been taken of natural outcrops of rock to construct a rock garden. Such gardens are usually the most convincing from a landscape standpoint, though they do not always provide the maximum in respect to the cultural requirements of the rock plants unless considerable tinkering is done with a view to providing bigger and deeper "pockets" for them.

Alpines and rock plants can be used to good advantage in parts of the garden other than the rock garden proper. They are, of course, *the* plants for wall gardening, and are well adapted for use in "pavement planting"—that form of gardening which uses plants in the crevices between flagstone walks. The problem of a satisfactory dividing line between perennial border and walk can often be solved by using rocks and planting between them with alpines so that they become partly covered with vegetation. This has been done with great success in many gardens and notably so at Aldenham House, near London, England, where a gravel walk is separated from the border by a device of this nature, thus

providing an informal and beautiful edging to the perennials.

In the Brooklyn Botanic Garden rock garden, in which glacial boulders are used, the general idea in construction was to simulate such a rock-strewn slope as one would be likely to find on a terminal moraine, since the Botanic Garden is located on the slope of such a moraine.

FIG. 8. Glory-of-the-Snow (*Chionodoxa Luciliæ*). (5617)

What is and what is not admissible to the rock garden in the way of plants is always a vexed question. We think of a rock garden primarily as a home for alpine and saxatile plants, and, in temperate climes, the bulk of its inhabitants should be drawn from this source. But not all of the mountain plants are desirable—some are nothing but lusty weeds, especially under lowland conditions—and there are many plants that fit admirably into the rock garden picture that would be excluded if measured by the yard-

stick "alpine and saxatile." One enthusiast vehemently asserts "that nothing should be grown in the rock garden that can just as easily be grown under ordinary garden conditions." But such a definition, if accepted, would eliminate many plants that are considered essential in the well-furnished rockery. One thing is sure—it is the acme of foolishness to go to the trouble of constructing a rock garden and then furnish it, as is oftentimes done, with such florists' flowers as geraniums, petunias, and nasturtiums. Bearing in mind the fact that bedding plants do not belong in the rock garden and remembering that among the chief characteristics of alpine plants, which in general do belong, are their dwarfness of habit, quality of bloom and brilliancy of color, let us agree with the late Reginald Farrer that our conception of acceptable plants "includes everything that will look well in a rock garden."

Although many of the alpine plants are difficult of cultivation in the lowlands, there is no lack of appropriate material that will thrive, if given a reasonable amount of care.

Amongst the easily grown rock plants one might mention many species of *Saxifraga,* a genus that is predominantly alpine and saxatile. *S. Cotyledon, S. cochlearis,* and *S. Macnabiana,* belonging in the group whose leaves show encrustations of lime, can readily be grown by planting them in well-drained soil in which there is a liberal mixture of broken limestone. The mossy varieties of *Saxifraga* are not difficult provided they are given a well-drained, stony soil with plenty of humus. They also appreciate a little shade. The surface of the soil about the plants should be covered with small stones to prevent evaporation of moisture and to keep the ground cool.

The hardy Pinks never look out of place in a rock garden provided that one excludes the florists' varieties. The most desirable of them all is the Glacier Pink (*Dianthus neglectus*) and the Alpine Pink (*Dianthus alpinus*). This family contains many other excellent rock plants that can be grown with very little trouble, for example: *Saponaria ocymoides, Gypsophila repens,* and several species of *Arenaria, Silene,* and *Cerastium.*

Of course, everyone who has a rock garden will want to grow the Edelweiss, and fortunately this can readily be accomplished by providing a well-drained soil, plenty of limestone, and an open

situation. If one has patience, this interesting plant can be easily raised from seed, but one must not expect flower heads the first year.

The following list of easily grown rock plants, in addition to those already mentioned, may be seen at the proper season in our Rock Garden:

*Plants Easy to Grow*

*Alyssum saxatile* (Golden-Tuft), E. Europe. Fls. golden yellow; 1 ft. April, May.

*Anemone Pulsatilla* (Pasque Flower), Europe. Violet fls. covered with long silken hairs; 6 in. to 12 in. April.

*Aquilegia canadensis.* North America. Scarlet and yellow fls.; 1 ft. to 2 ft. May.

*Aquilegìa cærulea* (Rocky Mountain Columbine). Blue and white fls.; 1 ft. to 2 ft. May, June.

*Arabis albida* fl. pl. Mediterranean region. Double, white fls.; 9 in. April, May.

*Aster alpinus.* Europe, Asia, North America. Bright purple, daisy-like fls.; 6 in. to 12 in. May, June.

*Aubrieta,* in var. Spreading prostrate plants. Colors rose, lavender, etc., May.

*Campanula cæspitosa.* Europe. Pale blue fls.; 4 in. to 6 in. June, July.

*Campanula carpatica.* Carpathians. Porcelain blue fls. erect on wiry stems; 9 in. July.

*Campanula garganica.* Italy. Blue fls., dwarf, spreading by underground stems; 4 in. June, July.

*Cerastium tomentosum.* S. Europe. Creeping species with gray foliage, fls. white; 6 in. May.

*Gypsophila cerastioides.* Himalayas. Fls. white, red-veined; creeping habit; 4 in. May.

*Gypsophila repens.* Europe. Dwarf creeping plant, white fls.; 4 in. May, June.

*Helianthemum nummularium* vars. (*H. vulgare*) (Rock Rose). (Not reliably hardy north of Philadelphia.) 9 in. to 12 in. Dwarf evergreen shrubs, brilliant fls. during summer.

*Houstonia cærulea.* N. Eastern States and Alleghenies. (Bluets. Quaker Lady). May.

*Iberis sempervirens.* (Perennial Candytuft) S. Europe. White fls.; 9 in. to 12 in. May.

*Iris cristata.* Mountains of Virginia and southwards. Dwarf Iris with light blue fls. May.

*Leontopodium alpinum.* (Edelweiss.) Whitish floral lvs.; Europe. 4 in. to 12 in. May, June.

FIG. 9. Pasque Flower (*Anemone Pulsatilla*). (5824)

FIG. 10. Pasque Flower (*Anemone Pulsatilla*), *in fruit.* (5825)

*Myosotis alpestris* (Alpine Forget-me-not). Europe, North America. Blue with yellow throat; 9 in. May.

*Nierembergia rivularis* (White-Cup). S. America. White fls. yellow or rosy throat; 3 in. June, July, August.

*Phlox divaricata.* E. N. America. Lavender blue fls.; 1 ft. May.

*Phlox subulata vars.* E. N. America. White, pink, etc.; 6 in. May.

*Saponaria ocymoides.* Europe. Dwarf creeping habit, rose colored fls.; 6 in. to 9 in. May.

*Saxifraga,* mossy vars. White, pink fls.; 3 in. to 9 in. April, May.

*Sedum,* dwarf vars. Various colors; 3 in. to 12 in. June, July.

*Sempervivum,* in var. Reddish and yellow fls.; 6 in. to 12 in. July.

*Silene alpestris.* Eastern Alps. White fls.; 4 in. to 6 in. May, June.

*Silene Schafta.* Caucasus. Pink fls., blooms in fall; 4 in. to 6 in.

*Statice Armeria* var. *Lauchcana.* More brightly colored than the common "Thrift." May. (Uusually cataloged by nurserymen as *Armeria maritima* var. *Lauchcana.*)

*Trollius laxus* (Globe Flower). N. America. Yellow or orange; 1 ft. to 2 ft.

*Viola cornuta.* Blue fls., blooms through summer; 6 in. to 9 in.

In the following list are some of the plants that have flourished in the Brooklyn Botanic Garden without over much coddling. They are not too intractable, but require that a little more attention be paid to their needs than those mentioned in the preceding list. Not all of them are commonly offered in the trade and it may be necessary to do considerable searching of catalogs of specialists before it is possible to acquire them all.

### *Plants Fairly Easy to Grow*

*Androsace lanuginosa.* Himalayas. Trailing stems, rosy lilac fls. June–September.

*Androsace sarmentosa.* Himalayas. Strawberry-like runners, pink fls. May.

*Bellium bellidioides.* S. Europe. A miniature English Daisy.

*Campanula pulloides.* (C. *pulla x carpatica* var. *turbinata.*) Dwarf, dark purple.

*Dianthus alpinus.* Alps. 3 in. Big, rose pink fls. June. Needs much crushed limestone.

*Draba aizoides.* Europe. 3 in. Brilliant yellow fls. Good for a crevice. March.

*Dryas octopetala* (Mountain Avens). N. Hemisphere. Creeping evergreen shrub. White fls.

*Genista silvestris* var. *pungens* (*dalmatica*). Pyrenees. Dwarf spiny shrub with yellow fls. June.

*Gentiana acaulis* (Stemless Gentian). Alps. 4 in. Real blue fls. May.
*Geranium argenteum.* S. Alps. 6 in. Silvery lvs., mauve pink fls. July. Gritty, well-drained soil.
*Hypericum olympicum.* Greece. 6 in. Trailing stems, yellow fls. June–July.
*Lithospermum purpureo-cæruleum.* S. W. Europe. Trailing shrub, dark blue fls. June.
*Penstemon glaber* (Blue Penstemon). N. America. 1 ft., 6 in. Large bright blue fls. July, August.
*Penstemon rupicola.* Rocky Mountains. Very dwarf, rose-crimson. May.
*Polygonum affine* (Himalayan Knotweed). Himalayas. 1 ft. Prostrate growth, red fls. in racemes.
*Primula Auricula* (Auricula). Alps. 6 in. Golden yellow fls. April.
*Primula frondosa.* Balkans. 4 in. Rosy lilac fls. Needs cool, well-drained situation.
*Silene acaulis* (Moss Campion). Alps. Arctic Regions. Dwarf mossy tuft with bright pink fls. May.
*Statice* (*Armeria*) *cæspitosa.* Spanish Sierras. Tufted, dwarf. Pale pink fls. May, June.
*Statice* (*Armeria*) *juncea.* Corsica. Tufted, 6 in. Pink fls. May, scattered fls. to November.
*Trollius pumilus* (Dwarf Globeflower). Himalayas. 6 in. Bright yellow. April, May.
*Veronica repens* (Creeping Speedwell). Corsica. ¼ in. Creeping, pale blue fls. May. Requires moist cool situation.
*Wahlenbergia Pumilio.* Dalmatia. 3 in. Tufted and floriferous, bell-shaped lilac fls. June.

The lists could be greatly extended by the addition of dwarf conifers, such as: Siebold Arborvitae (*Thuja orientalis* var. *Sieboldi*); Prostrate Juniper (*Juniperus communis* var. *depressa*); Dwarf Hinoki Cypress (*Chamæcyparis obtusa* var. *nana*); Moss Retinospora (*Chamæcyparis pisifera* var. *squarrosa*); and the Dwarf Alberta Spruce, *Picea glauca* var. *conica* (sometimes sold erroneously as *P. Albertiana*), a very slow growing form (Fig. 7); ferns such as: Ebony Spleenwort (*Asplenium platyneuron*); Maidenhair Spleenwort (*Asplenium trichomanes*); Walking-Fern (*Camptosorus rhizophyllus*); Purple Cliffbrake (*Pellæa atropurpurea*); Common Woodsia (*Woodsia obtusa*); mountain species of bulbs; and many of our own native alpines.

The true rock gardener gets his greatest thrill, however, from those species that are reluctant to thrive in his climate. To grow the more difficult and capricious alpines is indeed one of the most

fascinating features of rock gardening. Connoisseurs get unbounded pleasure from the successful cultivation of such treasures as *Anemone vernalis, Campanula Allionii, Gentiana verna, Saxifraga Boydii, Diapensia lapponica, Asperula suberosa, Ramondia pyrenaica, Rhododendron lapponicum* and others of a similar nature. Those who have mastered the cultivation of the easily grown

FIG. 11. Mossy Saxifrages. (2604)

alpines should try the more difficult subjects. Many helpful hints on their cultivation can be obtained from such books as, *Adventures in My Garden and Rock Garden,* and *Pleasures and Problems of a Rock Garden,* by Louise Beebe Wilder; *The Rock Garden Primer,* by Archie Thornton; *My Rock Garden* and *The English Rock Garden,* by Reginald Farrer; *Rock Garden and Alpine Plants,* by Henri Correvon.

# CHRONOLOGICAL GUIDE TO THE ROCK GARDEN OF THE BROOKLYN BOTANIC GARDEN

## *January*

In 1930, there was something of interest in bloom in the Rock Garden during every month of the year.

In *January* the pale lilac blossoms of the Palestinian *Iris Vartani* displayed themselves during the first two weeks. A cold spell necessitated covering until February 20th when flowers again were produced, continuing until about the middle of March. January usually sees some open flowers on *Erica carnea,* the Alpine Heath.

## *February*

During the latter part of *February* some of the mountain crocuses begin to bloom—notably *Crocus Korolkowi* and *C. vitellinus.* Snowdrops also may be expected to exhibit their pale drooping blooms along with the cheerful yellow of those of *Eranthis hyemalis,* the Winter Aconite. The kind that we grow in the rock garden is *E. hycmalis* var. *Tubergeni,* which has much larger flowers than those of the type.

## *March*

In *March* the bulbous plants are augmented by *Narcissus cyclamineus,* very distinctive with its completely reflexed perianth; *Scilla sibirica,* the Siberian Squill; *Hyacinthus azureus* (very similar to the Grape Hyacinth, *Muscari*); several species of *Iris,* and quite a few crocuses.

These bulbous irises coming, as they do, at a time when outdoor flowers are scarce, are altogether charming. We grow several species in the Rock Garden including *I. Histrio, histrioides, Vartani, reticulata,* and *reticulata* var. *Krelagei. I. reticulata* is, to my mind, the best of the easily grown, spring flowering, bulbous irises. Its flowers of rich blue-purple and gold have a delightful violet fragrance.

FIG. 12. *Iris pumila* varieties. (5808)

Many species and varieties of *Crocus* are now opening their flowers to the sun. Amongst them are *C. susianus,* the Cloth-of-Gold Crocus, and *C. biflorus,* the Scotch Crocus. This genus is fairly well represented in our Rock Garden, with twenty-six species and varieties of spring crocus and twenty of the autumn blooming kinds.

The non-bulbous plants are represented by *Helleborus fœtidus,* a dowdy, homely relative of the exquisite "Christmas Rose" (*H. nigcr*). The latter, however, has never seemed to appreciate our tender care and resolutely refuses to thrive. We, therefore, have to fall back on its ugly sister or cousin in order to have the genus represented, and this is our only, and it must be admitted, somewhat slight justification for growing *H. fœtidus.* It is not necessary to offer apologies for *Draba aizoides,* which pleases us with its bright yellow flowers during this month. Like the "Christmas Rose" it has a host of poor relations which are nothing better than pernicious weeds, but it also has many aristocratic connections such as *D. athoa, bryoides, cuspidata, Dedeana,* and *Kotschyi,* which are an ornament to any rock garden.

## *April*

Although *April* finds the rock garden still somewhat bare there are enough plants in bloom to give an inkling of the plethora to follow. Considerably over fifty species and varieties may be expected to display their flowers during this month including, of course, some hold-overs, from March. Bulbous plants are still much to the fore including Grape Hyacinths (*Muscari botryoides* and varieties, *M. moschatum, M. elegans,* and *M. racemosum*); a few tulip species, of which the most notable is *Tulipa Kauffmanniana,* sometimes called the Water-lily Tulip; *Narcissus,* and the Glory-of-the-Snow (*Chionodoxa* species and varieties). The latter are eminently satisfactory rock garden plants. They thrive and increase with practically no care, their flowers of various shades of blue, with some pink and some white forms, are cheerful and welcome, and they lend themselves admirably to association with dwarf carpeting plants. Several species and varieties are grown, the commonest being *C. Luciliæ* (Fig. 8).

FIG. 13. Spring Adonis (*Adonis vernalis*). (5797)

*Narcissus* is represented by the charming Angel's Tears Daffodil (*N. triandrus*), from Spain and Portugal, and the "Petticoat Daffodil" or "Hoop-Skirt Daffodil" (*N. Bulbocodium*), Southern France to Morocco. Both of these are on the border line of hardiness with us, but they came through last winter very successfully and we are hopeful for the future.

There is a miniature replica of the trumpet daffodils that may in some years be seen in our Rock Garden. This is *Narcissus*

FIG. 14. *Iris cristata.* (3225)

*minimus* which grows only three inches high. Unfortunately, it is not very permanent.

Non-bulbous plants are now beginning to give a better account of themselves. The Himalayan Primrose (*Primula denticulata*) produces its lavender flowers in dense globular heads, and various forms of the Auricula (*P. Auricula*) display their umbels of sweetly scented blossoms. We envy the English the myriads of handsome primroses available for their rock gardens. Correvon

lists over two hundred species and varieties that are being grown in gardens.* Two of our native Bleeding Hearts—*Dicentra eximia* from Western New York and the Mountains of Virginia, and *Dicentra formosa* from the Pacific Coast—come into bloom towards the end of the month. They are similar in appearance, both having finely divided foliage, with flowers of deep rose in *eximia* and pale rose in *formosa*. Both species grow well in shade and are tolerant of sunshine. There are colonies of these plants, from self-sown seed, all over the rock garden.

Another native, the interesting Mountain Pachysandra (*P. procumbens*) hailing from the mountains of Kentucky, West Virginia and southward, is conspicuous on account of its white filaments protruding from the inconspicuous brownish sepals. This species, unlike its popular relative, the Japanese Pachysandra so widely used as a ground cover, is seldom seen in gardens. Its foliage is dull compared to the oriental species, but its early blossoming makes it worth growing in limited quantities.

The buttercup-like flowers of *Trollius laxus,* the North American representative of the Globeflowers, are not so showy as those of the European and Asiatic kinds, but the plant is valuable for a wet spot in the garden because of its dwarfness and earliness.

Toward the middle of the month the " Pasque Flower " (*Anemone Pulsatilla,* Fig. 9) is displaying its rich purple flowers with their masses of yellow stamens. Each flower is surrounded by a lacy ruff of gray-green, hairy bracts. Its achenes with long feathery styles (Fig. 10) are much in evidence after the blossoms have fallen, and serve to prolong the period of its attractiveness. It is widely distributed in Europe and Siberia in both alpine and lowland regions, and is quite amenable to cultivation.

A close relative, formerly considered in the same genus, is the well-known *Hepatica americana* with flowers of white, blue, or pink. It is a welcome sight when seen in our rocky woodlands and is equally acceptable in the rock garden. *Hepatica* has simple lobed leaves and the circle of bracts close to the flower, while *Anemone* has compound or dissected leaves and the circle of bracts further down the flower-stalk.

* Rock Garden and Alpine Plants, by Henri Correvon. The Macmillan Co., New York. 1930.

Several members of the Mustard Family are now becoming conspicuous. *Draba aizoides,* about two inches high, remains in good condition and is joined by *D. cuspidata,* similar but somewhat larger. The mountain Alyssum (*A. montanum*), a very dwarf species with hoary leaves and yellow flowers, opens its flowers about the 14th and remains in bloom for about six weeks; the well-known "Goldentuft" (*A. saxatile,* Fig. 3) and its varieties, follow closely on the heels of *A. montanum.* The Goldentuft is

FIG. 15. *Saponaria ocymoides* and Roof Iris (*Iris tectorum*). (3472)

very successful in a dry situation, and is one of the best wall-garden plants for our climate. The "Wallcress" (*Arabis albida*) usually shows its white flower buds during the second week of April and gives a good account of itself until beyond the middle of May. Because of its lasting qualities the double flowered form of this species is much to be preferred. The deep blue flower-spikes of *Muscari racemosum* and the white candelabra of *Arabis* form a charming combination when these two species are interplanted. *Arabis albida,* in this country, is usually offered in cata-

FIG. 16. European Globe-Flower (*Trollius europæus*). (6206)

logs under the name *A. alpina,* a different species of not much account. *Arabis aubretioides,* a charming dwarf species from Asia Minor and Persia, is not very permanent with us, but when it does deign to favor us its pink flowers are much admired.

Several forms of the large leaved saxifrages, referred by some authorities to the genus *Megasea* and by some to *Bergenia,* display their handsome pink flowers about the middle of the month. These saxifrages are useful in the large rock garden and would be more so were it not that the beauty of their evergreen leaves is usually marred by the rigors of our winters. Several species and varieties of mossy saxifrages (Fig. 11) are in bloom by April 20th. In former years these saxifrages did marvellously well in Brooklyn but of late, for some unknown reason, we have had some difficulty in keeping them alive.

Other plants that bloom during April include *Brunnera macrophylla,* better known as *Anchusa myosotidiflora,* and *Omphalodes verna,* both members of the Borage Family with real blue flowers; *Epimedium alpinum* var. *rubrum,* and other forms, all good shade plants with handsome foliage; *Euphorbia Mysinites,* a spurge with trailing stems and glaucous foliage; and many forms of *Iris pumila* (Fig. 12).

## *May (First Half)*

The rock garden is so lavish of bloom during *May* that many worthy plants must, in this brief guide, remain unmentioned. The Alpine Forget-me-Not (*Myosotis alpestris*), of azure blue, is at its best during the early part of the month. It should be planted where it receives partial shade, and, as it is more or less biennial, seeds should be allowed to form so that they may provide seedlings to carry on in succeeding years.

The various forms of *Aubrieta deltoidea,* floriferous dwarfs of the Mustard Family, ranging in color from white through pink to dark purple, are a disappointment to those who are familiar with their long blooming qualities as exhibited in mild climates like that of England. But even here they are worthy of inclusion in the rock garden although our hot sun causes them quickly to pass out of bloom. Our best variety is one received under the name of *A. deltoidea* var. *purpurea.*

Others of the Mustard Family that are conspicuous at this time are the Perennial Candytuft (*Iberis sempervirens*), with white flowers and evergreen foliage, and a Blister Cress with brilliant orange flowers. This last mentioned unfortunate suffers from many aliases, being known as *Erysimum asperum, Cheiranthus Allionii, Erysimum Allionii,* and *E. Perofskyanum,* while some

FIG. 17. Japanese Primrose (*Primula japonica*). (4565)

authorities maintain that *Erysimum* should rightly be called *Cheirinia!* A little later in May the yellow flowers of a variety received as *Erysimum asperum* var. *perenne* help to brighten up the rock garden.

The first of the Columbines to bloom with us is the glaucous leaved *Aquilegia flabellata* var. *nana-alba,* from Japan. It is usually in bloom the first week of May, has white flowers, and is

about nine inches high. Closely following it is our Common Columbine with flowers of cinnabar red and yellow. This commonly grows wild in rocky places and is thus very appropriate in a rock garden. About the same time we expect to see the exquisite Rocky Mountain Columbine, *A. cærulea*, with its flowers of white and blue, with sometimes a suggestion of yellow. The deep blue flowers of the Alpine Columbine (*A. alpina*), from Europe, open in May and continue into June. These four columbines form an adequate representation of the genus for rock garden purposes, the many garden hybrids being more appropriately cared for in the perennial border.

The Rock Jasmines (*Androsace*), typical alpine plants, are represented during the first week of May by *A. sarmentosa,* a species with pink flowers in umbels rising about three inches from the ground. It comes from the Himalayas, and has attractive rosettes of grayish foliage produced at the tips of runners. The rarity of *Androsace* in American gardens may be deduced from the fact that the genus is not even mentioned in "Standardized Plant Names." The saxatile group represented by such species as *A. helvetica, A. alpina,* etc., are very difficult to grow and are seldom seen in gardens. The kinds that we have had success with belong in another group, which, instead of forming the tight cushions of the *helvetica* series, is inclined to make trailing stems, or runners, somewhat after the fashion of the strawberry. Included in this group are *A. carnea brigantiaca* (tufted) (Fig. 6); *A. sarmentosa* and its varieties; *A. primuloides,* similar to the last but later in coming into bloom; *A. foliosa* (end of May); a rather lush looking plant from the Himalayas that is not very permanent; and *A. lanuginosa,* which flowers from June onwards. The dainty, fragile looking *A. lactiflora,* which is an annual, springs up from self-sown seeds, and its white flowers are charming throughout the month of May.

The Spring Adonis (*Adonis vernalis,* Fig. 13), with its enormous, glistening, yellow flowers and refined, much divided foliage, is one of the bright spots in the rock garden at this time. It grows well in moist soil and is vastly superior to the earlier blooming Amur Adonis which looks somewhat carroty, and consequently weedy, after it has passed its blooming period.

Violas of several kinds; varieties of *Phlox subulata; Silene caroliniana* (*S. pennsylvanica*); mossy saxifrages; *Primula Sieboldi; Iris cristata* (Fig. 14), from the Mountains of Kentucky, Virginia, and the Carolinas; *Iris tectorum* (Fig. 15), the Roof Iris of Japan, in blue and white forms, *Houstonia; Epimedium; Fritillaria meleagris* varieties; and *Tulipa chrysantha;* are amongst the plants in bloom during the first two weeks of May.

FIG. 18. *Saxifraga Macnabiana* in rock cleft. (2605)

## *May (Last Half)*

The European and Asiatic Globe Flowers (*Trollius,* Fig. 16), glorified buttercups of moist alpine meadows, are, with the exception of such dwarfs as *T. acaulis* and *T. pumilus,* too robust for the small rock garden. We grow large patches of *T. asiaticus* and *T. europeaus* in a low moist place where their yellow flowers form a pleasing contrast with the blue of *Veronica Teucrium,* planted nearby.

There are many charming "Speedwells" (*Veronica*) coming along at about this time. *Veronica rupestris,* raised from seeds, gave us a heteromorphic conglomeration of dwarfs not over three inches high, which are simply smothered with racemes of flowers in shades of pink and blue.

*Veronica pectinata* makes a close carpet of gray, woolly foliage. There are two forms, one with rose colored flowers, the other with blue. *V. gentianoides* has bright green foliage with spires of blue flowers about eighteen inches high. *V. repens* is a diminutive creeper with pale blue flowers, barely attaining a height of one half an inch. A little shade and moist well-drained soil is appreciated by this delightful Speedwell. Others of this genus that are worthy of mention are *V. Allionii* and *V. filiformis,* both valuable carpeting plants.

The silvery, and gray leaved Millfoils are good for sunny, dry places in the rock garden. If treated liberally in the matter of soil they grow too lush and pass out during the winter or during hot humid spells in the summer. One of the best of the silvery kinds is *Achillea ageratifolia* var. *Aizoon* (*Anthemis Aizoon*), European Alps, which displays its heads of white flowers on eight inch stems at this time. Another desirable species is *A. serbica* from the Balkan region with gray-green, toothed leaves and white flowers.

Primroses of various kinds are now blooming. Those with flowers in whorls are represented by *Primula japonica* (Fig. 17), with leaves which remind one of Romaine lettuce, and flowers ranging in color from white to carmine. This is a strong growing kind that delights in moisture. Others in this group are *P. Bulleyana,* bright orange, and its hybrids. The Asiatic *P. Sieboldi,* belonging in the *cortusoides* section with loose heads of flowers on fragile stems, grows well in half-shady places in soil rich in humus. There are many garden forms of this species. Then we have a number of kinds received under various names that have a strong resemblance to the Cowslip (*Primula veris*). These have yellow flowers, in umbels, that possess a faint, delicious perfume.

The Alpine Aster (*A. alpinus*), of which there are many, many, forms is now profusely in bloom. The variety *alba* is not so

much, but the purple flowered kinds are excellent—in particular, the variety *speciosus*.

The saxifrages are now beginning to be more in evidence. By the end of the month, many belonging to the "encrusted" section

FIG. 19. *Iris flavissima* (*I. arenaria*). (5709)

will be showing their white or pink blooms. *Saxifraga Aizoon* and its varieties are admirable, either for their silvery foliage or for their flowers. *S. Cotyledon* displays its two foot panicles of white flowers. *S. Macnabiana* (Fig. 18), a hybrid, of shorter growth, its white flowers dotted with red, is perhaps the most

easily contented of this group. London Pride (*Saxifraga umbrosa*), is excellent for a shady situation with good soil. It makes rosettes of spatula-like leaves with pink flowers in airy panicles eight to twelve inches high. Another shade-lover is *S. rotundifolia* with white flowers and orbicular leaves on longish petioles.

The Golden Drop (*Onosma echioides*), though scorned by some as being coarse and weedy, with us may usually be relied upon to make a handsome display of clear yellow flowers. It needs a hot sunny situation and rather poor soil.

The Sea Pink or Common Thrift,—you may call it *Statice Armeria, Armeria vulgaris,* or *Armeria maritima*—is valuable for its long blooming qualities, dwarfness, and neat, bright green foliage (Fig. 1). Its variety *Laucheana* has brighter, darker, rosy flowers. The prize of this genus, however, is the rare *A. cæspitosa,* about two inches high with almost stemless heads of pale pink flowers. Another species, *A. juncea,* blooms off-and-on from May until November, and in beauty and rarity ranks between *A. cæspitosa* and the Common Thrift.

The rare and charming *Iris flavissima* (*I. arenaria*) (Fig. 19), in its good tempered years, gives a succession of yellow flowers on stems three or four inches high. In a shady spot in rich woods soil the dainty *Iris gracilipes* is most at home (Fig. 20). Farrer displays much enthusiasm in his description of this species: "Of all my little Irises . . . *Iris gracilipes* is queen—a grassy-growing thing, forming a tuft, but never spreading along the ground, with three or four flowers carried on airy stems five inches high or so. And these flowers are, in shape, miniatures of the half-hardy *fimbriata* with spreading bold falls and tiny standards. But in build and coloring they are more exquisite than most things seen outside a dream, cut from the filmiest soft pale-blue silk, crumpled into half a dozen different lights and tones with a deeper eye surrounding the pale lined blotch, and following along the crest."

The Rock Candytuft (*Iberis saxatilis,* Fig. 21) is now at its best. This is a valuable long-blooming species, dwarfer, and, if anything, more floriferous than the more commonly grown *I. sempervirens.*

Other plants in bloom at this time include: *Mazus reptans* (Figs. 4 and 6) from the Himalayas, a carpeter that is sometimes too

rampant; *Lychnis alpina,* a biennial of only moderate value; *Phlox amœna, divaricata,* and *subulata* varieties; *Dodecatheon radicatum,* a Shooting Star from the Rocky Mountain Region; *Saponaria ocymoides* (Fig. 15), a trailer smothered in blossoms of white or pink, which, with *Iris tectorum* (Fig. 15) has formed a spectacular colony from self-sown seeds; *Iris verna,* a dwarf

FIG. 20. *Iris gracilipes.* (6916)

native with violet and yellow flowers; *Helianthemum; Gypsophila; Dianthus,* and many others.

*June*

Although many members of the *Caryophyllaceae* (Pink Family) begin to bloom in May, the rock garden representatives of this family are perhaps more numerous and at their best in early *June.*

FIG. 21. *Iberis saxatilis* growing in rock cleft. (2601)

The mountain pinks contain some of the choicest rock garden plants. *Dianthus alpinus,* a dwarf with enormous rose-pink flowers; *D. neglectus,* also dwarf, its pink flowers having the reverse of the petals a satiny buff; *D. sylvestris,* a little taller, with pink flowers on gracefully arching stems, are among the best.

Dwarf species of Baby's Breath (*Gypsophila*), include *G. cerastioides* from the Himalayas, white flowers with purple lines, produced very abundantly, and *G. repens,* trailing, with glaucous foliage and white flowers. There is a double flowered form of the latter, one with pinkish flowers, and one variously known as var. *major* or var. *monstrosa* (Fig. 22), that reaches a height of a foot or eighteen inches. One of the best of the Sandworts, *Arenaria montana,* a straggler with large white flowers, is not very permanent with us. I have seen this species in England thriving amazingly in a brick wall laid up without mortar. *A. stricta* makes a cloud of linear foliage on fragile stems topped with small white flowers. *Arenaria Bauhinorum* (*A. liniflora*) about three inches high is almost completely smothered with white flowers. The *Arenaria* and closely allied *Alsine, Sagina,* and *Cerastium,* though often beautiful, will bear close watching in the rock garden as many of them are insidious invaders by underground runners or seeds, and quickly crowd out less robust plants in their vicinity. In this category belong Snow-in-Summer (*Cerastium tomentosum*), having white leaves and flowers, and the somewhat stronger *C. Biebersteinii* with gray leaves and white flowers.

*Saponaria ocymoides* continues its sprawling career into June. This, too, tries to take possession of the whole rock garden to display its white, pink, or parti-colored flowers, but it is easily controlled. The Pyrenean *S. cæspitosa* is far less rampant. It has close tufts of shiny foliage, and rosy flowers on ascending stems of six inches or so.

The Alpine Catchfly (*Silene alpestris*) makes close mats of foliage surmounted by myriads of pure white flowers on three-inch stems. *S. acaulis,* which might be so wonderful as a rock garden plant but which seldom is, has its pillows of foliage, formed of closely crowded rosettes of linear leaves, sparingly spangled with stemless flowers of bright pink. Under the right conditions

it is capable of being so floriferous that the foliage is almost completely hidden.

Other conspicuous members of the " Pink Family " in the rock garden at this time are, in addition to many named kinds, dozens of nondescript *Dianthus* varieties that originated as self-sown seedlings and which we have perhaps not been ruthless enough in removing.

FIG. 22. *Gypsophila repens* var. *monstrosa*. (2599)

The Alpine Toadflax (*Linaria alpina*), unlike many of its relatives, is never too much of a good thing. It is a lovely plant only a few inches high, with delicate gray foliage and flowers of violet and orange. Not truly perennial, it usually may be relied upon to perpetuate itself by self-sown seeds. It blooms throughout the whole summer. *Cymbalaria pilosa* (*Linaria pilosa*) at home in the Apennines, forms a mat of soft hairy foliage and is in bloom from June to September. Its lilac flowers are purple striped on

the upper petals, with white and yellow centers. We used to grow *Cymbalaria hepaticæfolia* (*Linaria hepaticæfolia*), but it proved to be so ubiquituous that it was deemed advisable to eliminate it before it got beyond control.

The Yellow Corydalis (*C. lutea*), seeds itself freely and finds harborage in chinks between the stones where it displays its handsome glaucous foliage and its yellow flowers from May to September. It delights in shade.

A Willow-herb from New Zealand has seeded itself here and there throughout the rock garden. It is *Epilobium nummularifolium,* a tiny creeeper that closely hugs the ground. Its small round leaves vary in color from light bronze-green to copper according to exposure and the time of year. Its little bits of flowers are of small consequence except as a means of reproduction. Its seed-pods almost humorously resemble those of its cousin, the Great Willow Herb (*E. angustifolium*), thus disclosing its botanical affinities.

June is the Bellflower month. Many of them just come and go, some are weedy and fit only for the wildflower garden, but some are permanent and beautiful. In the last group, we must include the Carpathian Bellflower (*Campanula carpatica*) and its many varieties. The variety *turbinata* of this species is reputed to be one of the parents of *C. pulloides* (*C. pulla x C. carpatica* var. *turbinata*), handsome with violet colored flowers. *C. garganica* and its varieties; *C. rotundifolia* var. *Hostii* (Fig. 7), a glorified Harebell; *C. Portenschlagiana; C. rotundifolia,* the Harebell, or Bluebells of Scotland, and *C. versicolor,* a moderately tall species along the lines of the Peachleaf Bellflower, are all good and easy to grow. The very rare *Campanula speciosa* (Fig. 23), from high limestone cliffs and screes in the Pyrenees does not, unfortunately, belong in the "easy to grow" group—at least not with us. The photograph of a group growing in our garden gives an inkling of what a glorious rock plant this species is. It forms a rosette of narrow, hairy leaves from which springs an upright spike of bloom—the individual flowers being like those of Canterbury Bells. When, and if, obtainable it should be planted in well-drained, gritty, limestone soil.

Those seeing the Edelweiss (*Leontopodium alpinum,* Fig. 24), in a city garden with its flannel-like bracts of a dingy gray are apt to wonder why so much fuss and furor about so unattractive a plant. But they should remember that its bracts are seldom so white as when produced under alpine skies and their woolliness catches the soot and dust of the city to perfection.

FIG. 23. *Campanula speciosa.* (4062)

The Whitecup (*Nierembergia rivularis*), a relative of the potato, not over two inches high, produces its white flowers with a yellow throat, which are almost two inches in diameter, from June until the fall.

The dried-up looking *Phlox Hoodii,* growing in the moraine, now surprises us by mantling itself with white flowers, faintly tinged with lilac.

Several varieties of Cranesbill (*Geranium*) are at their best in June. *Geranium sanguineum* in its larger forms is too rampant

for the small rock garden, but the varieties *lancastriense* and *prostratum* may be admitted without much danger. The silvery-leaved, pink flowered *G. argenteum* is the prize of the genus, and *G. cinereum,* with gray leaves and mauve flowers, is a close second.

The overwhelmingly North American genus *Penstemon* has many representatives that bloom this month. *P. unilateralis,* from the Rocky Mountains, with pink and blue flowers, is among the showiest.

The Sunrose (*Helianthemum*), sometimes called Rockrose, is a genus that is most floriferous in poor calcareous soil and a sunny situation. We grow many forms, some of them, varieties of *H. nummularium* (*H. vulgare*), are rather too robust for the small rock garden. *H. canum,* however, is never too rampageous, only a few inches high, but prodigal of its clear yellow flowers displayed over the gray-green foliage.

Early in the month the Scarlet Mallow, *Malvastrum coccineum* begins to display its flowers of intense copper-scarlet against a background of gray foliage. It is a trailer and comes from our own north-west. Correvon has high praise for it, which is well merited, but he complains "It never seeds with us and we have great trouble in finding cuttings on it."

From the Pyrenees and Spain comes a trailing Snapdragon, *Antirrhinum Asarina,* that is valuable for planting in rock crevices. Although not hardy over winter with us, it usually may be relied upon to persist by means of self-sown seeds.

Other genera that we expect to find in bloom in June are *Sedum* and *Sempervivum;* dwarf thymes in great variety, *Viola; Œnothera;* and many others.

### *July*

By this time the number of species in bloom in the rock garden is on the wane but there is still enough variety to make a visit worth while, for, in addition to newcomers, many of those which started blossoming in June continue their career into July or even later.

The Golden Flax (*Linum flavum*), which by means of self sown seeds has taken possession of a good sized patch of the rock garden, provides a brilliant spot of color at this time. This is a plant that is undeservedly neglected in our gardens.

It would seem to be a hopeless task to attempt to single out the Sempervivums by name—their nomenclature is confused and there are so many of them. According to Correvon, Dr. Jordan of Lyon claimed to have growing in his garden 6,000 different forms of *Sempervivum!* They are indispensable in the rock garden, but their value is largely in their foliage, displayed in rosettes of varying form. The Spiderweb Houseleek (*S. arachnoideum,*

FIG. 24. Edelweiss (*Leontopodium alpinum*). (2607)

Fig. 25), is however, attractice when in bloom, with its starry, red flowers on slender stems. Other distinct kinds are: *calcareum, Fauconetti, blandum* (*rubicundum* of catalogs), and *soboliferum.*

Much the same kind of remarks apply to *Sedum* except that, thanks to Praeger's monograph,[1] there is a possibility of christen-

[1] An account of the Genus Sedum as found in Cultivation. Journal of the Royal Horticultural Society, Vol. 46. 1921.

ing them with a reasonable degree of certitude, and on the whole their flowers have greater variety and are more attractive. *Sedum acre* is one of our worst weeds, but we tolerate it because it makes mats of bright green foliage topped in late June and early July with brilliant yellow flowers. *S. cæruleum,* the opposite of *acre* in almost every respect, is an annual with fat leaves and pale blue flowers. *S. album,* green leaves, white flowers; *S. altissimum* gray leaves, creamy flowers; *S. dasyphyllum,* very dwarf, gray leaves with white or pinkish flowers; *S. spurium* and its varieties (var. *coccineum* is the best) are among the Sedums blooming in July.

*Mentha Requieni* should be planted in a moist situation, near a walk so that it may, occasionally (not too often), be stepped on to enable one to enjoy its delicious aromatic fragrance. It is a Lilliputian mint closely carpeting the ground, and its violet colored flowers, in late June or early July, are so tiny that even the observing are to be excused if they fail to notice them.

A delightful form of the Virginia Spiderwort (*Tradescantia virginiana,* Fig. 26), with large, pale blue flowers, made its appearance in the Rock Garden a few years ago. We have no record of ever having planted it there. Theoretically it should be uprooted, because it does not belong, but it fits in so beautifully in its self-chosen position that no one has had the heart to banish it.

The Alpine Poppy (*Papaver alpinum*) is a miniature edition of the popular Iceland Poppy. It is not very permanent and requires a limy, gritty soil. It is so delicate and graceful and there is such a wide range of colors in its various forms that it is well worth fussing with.

The nodding blue flowers (it is the sepals that provide the color) of *Clematis integrifolia* are usually at their best early in July. This Clematis is herbaceous in character, erect, and about two feet high. It is all too seldom seen in gardens and may be grown in the perennial border as well as in the rock garden.

From the far away Himalayas comes the Nepal Cinquefoil (*Potentilla nepalensis*). This species is valuable for its late and long blooming habits, and its cheery flowers of cherry red.

*Mazus reptans* (sometimes sold erroneously as *M. rugosus*), also from the Himalayas, continues to produce its flowers of violet

FIG. 25. Spiderweb Houseleek (*Sempervivum arachnoideum*). (6348)

and gold into July. Although only an inch or two high, it is, when planted in good moist soil, so rampant that it must be closely watched to prevent it from smothering its less robust neighbors. It is good for carpeting the ground between stepping stones.

Very attractive in early July is *Jasione montana,* a relative of the bell-flowers (*Campanula*). Unlike many of our alpine and rock plants it has no lack of common names—you may call it Blue-bonnets, Blue-buttons, Blue-daisy, Iron-flower, Sheep's-bit, or Sheep's-bit Scabious! Its flowers are produced in heads on stems about nine inches high.

The Lady's Mantle (*Alchemilla alpina*) from the European Alps, has worthless flowers but compensates in the beauty of its foliage. Its digitate leaves are glossy green above, and silvery below with silken hairs. A relative, *A. major,* also a native of the mountains of Europe, has claims to distinction as a foliage plant with pale green leaves not so deeply divided as those of the first named.

*Talinum calycinum* is an interesting native whose range is through Arkansas, Missouri, Nebraska, and southward into Mexico. It is related to the ever popular *Portulaca.* Its deep pink flowers are produced over a long period. A sunny rock cleft or well drained gritty soil suits it admirably. It has survived two winters in our rock garden but whether it will persist if subjected to a real hard winter is open to question.

The Alpine Scullcap (*Scutellaria alpina*) is another plant that commends itself for its long blooming habits. Although not showy, its lilac-blue and white flowers are pleasing and are in evidence from May until September. We grow also the var. *prostrata* which is perhaps more typically alpine in appearance.

The Tunic-Flower (*Tunica Saxifraga*) may be expected to give blooms from May to November. It is well suited if planted in poor soil in a dry, sunny situation where it produces its small rosy pink flowers in great abundance on wiry stems.

Writing of Gentians Farrer says[1] "Give them pure, cool air. They are as much dependent on good, bracing air as Mrs. John Knightley and her babies. They might almost be called comparatively careless about soil if only the atmosphere be moist and clean.

[1] Reginald Farrer, *My Rock Garden.* Edward Arnold, London. 1920.

They demand, in fact, hill air." If this is so, and our experience with Gentians supports Farrer's contention, what chance have we in Brooklyn of growing these aristocrats of the mountain tops? Occasionally we get a bloom on *Gentiana acaulis,* such mediocrities as *G. cruciata* and *G. tibetica* from time to time thrive lustily, but such happenings are of little moment compared to the glorious manifestations of which this race is capable. One handsome species, however, we may plant with good expectation of success, and that is *G. septemfida,* whose flowers of soft blue are produced from July to October.

Other flowers that may be seen in the rock garden in July include *Campanula, Phyteuma, Symphyandra, Horminum,* and *Mimulus.*

### *August*

Most of the plants blooming in *August* are hold-overs from preceding months.

The Balloon flower (*Platycodon grandiflorum*) starts its blossoming career in late June and continues into August. Its dull blue flowers, balloon shaped in bud, are legion, and prodigal in their production of seeds, which, unfortunately, scatter and germinate freely, necessitating ruthless weeding of the seedlings if they are to be kept from monopolizing the whole rock garden. The var. *Mariesii,* dwarfer and less rampant, is to be preferred in the small garden.

The Knotweeds (*Polygonum*) on the whole must be rigorously excluded from the rock garden. An exception is *P. affine* (*P. Brunonis*), a trailing species from the Himalayas which has atatractive foliage and spikes of red flowers. We grow also *P. alpinum* (May, June) which, although its white, feathery panicles are beautiful, is to be viewed with suspicion because of its invading tendencies.

An interesting little Tickseed (*Coreopsis rosea*) is now in bloom. It is native to the Eastern States from Massachusetts to Georgia. Perhaps some will cavil at this species being allowed in the rock garden, but its daisy-like, rosy flowers with yellow centers are welcome at this time and it does not look out of place. It attains a height of about eighteen inches.

FIG. 26. Spiderwort (*Tradescantia virginiana* var.), (6349)

The delightful trailing *Androsace* (*A. lanuginosa*) and its variety *Leichtlinii* continue to bloom along with the Whitecup (*Nierembergia rivularis*). Other August flowers are *Allium tibetica, Veronica maritima* (*V. longifolia*), *Vittadinia australis;* and the bulky *Ligularia clivorum* (*Senecio clivorum*), better suited in the bog-garden than in the rock garden.

*September*

The Mount Etna Lily (*Sternbergia lutea*) has bright yellow goblet-like flowers which it displayed for us last September. Its habits are faulty when considered in conjunction with our climate, for its leaves are formed after it blossoms with the result that they are likely to be injured by frost before they have performed their allotted task of providing for the following year.

Hardy *Cyclamen* may be expected to display their blooms at this time. We grow *C. indicum* (*C. hederæfolium*) and *C. europæum.* To many, these *Cyclamen,* which in Europe are sometimes called by the unromantic name " Sowbread," are more attractive than the larger and showier florists' *Cyclamen.* These wildings are not easy to grow in our climate and when winter goes we watch for their reappearance with mingled hope and fear.

The clear blue flowers of *Ceratostigma plumbaginoides* are now at their best. At one time we were allowed to call it *Plumbago Larpentæ,* which was bad enough, but the powers-that-be have decided that the first mentioned name is preferable so we must fall in line. The " common " name, " Larpente Plumbago," may offer a means of escape for those on whose tongue and ears the Latin forms are unfamiliar. It is so beautiful, and so valuable in its late blooming habit, that it is indispensable. It is a sprawly plant, with good foliage that often colors beautifully. It is one of the latest plants to start into growth in the spring and this must be kept in mind when digging or cultivating in its vicinity during the first part of the year.

If the season of bloom in the rock garden is to be prolonged beyond August we must not be too severe in our interpretation of our definition of what is suitable rock garden material. Otherwise it might seem necessary to omit the Azure Sage (*Salvia azurea*), and *S. Pitcheri* (*S. azurea* var. *grandiflora*). Their

FIG. 27. *Aster* "Mauve Cushion." (4815)

height of three feet or more combined with a leggy, floppy habit of growth is against them, but their azure flowers are charming, and, if planted in poor soil in a hot dry situation, their tendency towards height and straggliness is to a large extent overcome.

The somewhat woody Chamaedrys Germander (*Teucrium Chamædrys*) is of value more for its neat glossy foliage than its inadequately displayed flowers of rosy red. These are not entirely despicable however, and its aromatic foliage and late blooming commend it.

September sees the opening of the flowers of the dwarf, spreading, perennial aster, listed in catalogs as *Aster* "Mauve Cushion" (Fig. 27), which continues in bloom well into November. It is reputed to come from Japan. The name "Mauve Cushion" is descriptive except as to color, which is an extremely pallid tint of mauve to say the least. For rock garden purposes it is best planted in poor soil to curb its exuberance. Although it thrives in full sunlight, it will also endure considerable shade.

## *October*

In October bulbous plants are with us again in considerable force.

Several species and varieties of the Meadow Saffron, unfortunately sometimes called Autumn Crocus, are now conspicuous. In their finer forms these resemble Brobdingnagian crocuses, although in reality they belong in the Lily Family, while crocuses are affiliated with the irises. *Colchicum speciosum* and its varieties (in addition to the type we have var. *album* and var. *atro-rubens*) are considered the most desirable. The first named has flowers of clear rosy pink, *album* is pure white and *atro-rubens,* is. according to a catalog description, "ruby-violet with white throat." Some of the species have curious tessellated flowers of purple and white as in *Parkinsonii* (we do not have this kind), or purple and lilac as in *variegatum* which blooms in September. The commonest species is *C. autumnale,* of which there are several forms, including a white one, var. *album.* We bless these Meadow Saffrons in the fall when their cheery blossoms brighten up the rock garden, but in the spring, when their coarse, heavy foliage dominates the scene we are tempted to wish them elsewhere.

No serious complaint is entered with regard to the foliage of the autumn crocuses which, like that of their spring blooming sisters, is grass-like and comparatively inconspicuous. These autumn blooming crocuses have, until recent years, been much neglected in this country, but now-a-days their value is becoming better appreciated and in consequence they are less of a rarity in gardens. Their colors, in general, range from white to purple. The showiest and most desirable species is *Crocus speciosus* with

FIG. 28. *Crocus zonatus*—ground cover *Cerastium Thomasii.* (2598)

flowers of bright blue. There are several varieties of this species, of which we grow the following: *Aitchisonii, albus,* "Artabir," *globosus,* and "Pollux." The pale lilac flowers of the Cilician *C. zonatus* (Fig. 28), also display their fragile-looking perianths along with those of the bright lilac *C. sativus.* Forms of the last named species are grown commercially for the production of Saffron used in coloring cakes, etc. The use of the stigmas and the upper part of the styles as a source of Saffron has been known since the time of Homer.

*November*

With the exception of some of the autumn crocuses, which still continue into this month, blossoming is now limited to stray flowers on those persistent species that commenced their efforts months before. If the weather is not too cold and boisterous a fair display may be made by such plants as the Harebell (*Campanula rotundifolia*); *Daphne Cneorum; Callirhoe involucrata; Tunica Saxifraga; Dicentra eximia;* and two or three species of *Statice. Statice juncea* is especially noteworthy for its late blossoming; sometimes as late as Thanksgiving it may be seen bravely displaying its heads of pink blossoms.

The comparatively new hardy perennial, *Chrysanthemum koreanum,* holds its white flowers, tinged with pink in age, well into November. This species is better fitted for the perennial border than the rock garden.

*December*

He who maintains that the rock garden is attractive even in December might be rated as an incurable optimist, but nevertheless a real rock garden enthusiast can find joy in the dwarf evergreens, including various Conifers, *Sedum, Sempervium, Iberis,* etc., that are so appropriate in the rock garden; the bright-red berries of the Rock Spray (*Cotoneaster*), and the few flowers that still remain. These last are usually limited to a few species of *Crocus* that have the temerity to continue opening their flowers in spite of the season. Amongst these tardy bloomers are *C. ochroleucus,* with creamy flowers tinged with yellow at the throat; *C. Salzmanni,* that sends up its dark lilac flowers in succession as though it had no intention whatever of stopping; *C. asturicus,* and *C. longiflorus,* with lilac colored flowers. The latter is the showiest of this ambitious quartet.

And so the rock garden year comes to an end, not in a blaze of glory, it is true, but with the promise of good things to come—for the flower buds on the Alpine Heath (*Erica carnea*) are already plainly visible and ready to open as soon as the weather man gives them the slightest encouragement.

## Selected List of Books on Rock Gardens and Alpine Plants

The books in this list (with the exception of the titles marked with an asterisk) are in the Brooklyn Botanic Garden Library, which is open to the public from 9 A.M. to 5 P.M., Monday to Friday, and 9 A.M. to 12 M. on Saturday.


Adams, H. S. *Making a rock garden.* New York. McBride, Nast, 1912.

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McCully, Anderson. *American Alpines in the Garden.* Macmillan Co., New York. 1931.
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Miyoshi, M. and Makino, T. *Pocket atlas of Alpine plants of Japan.* 2d edition revised. Tokio, 1907.
Rockwell, F. F. *Rock gardens.* New York. Macmillan Co., 1928.
*Sanders, T. W. *Rock gardens and Alpine plants.* 3d edition. London. W. H. and L. Collingridge, 1922.
Schacht, W. *Blumen in den Alpen.* Berlin. Sommer, 1929.
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Thompson, H. S. *Alpine plants of Europe, together with cultural hints.* London. Routledge, 1911.
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* Resigned December 11, 1930, to take effect May 14, 1931.

# PUBLICATIONS

OF THE

# BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.50 a year. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

*55. Physiologic races of bunt of wheat.* 14 pages. 1928.

*56. The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

*57. New physiologic races of oat smuts.* 22 pages. 1930.

*58. A new method of producing and detecting sorghum hybrids.* 12 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record;* see above.

*Guide No. 3. The story of our metate: A chronicle of corn.* Illustrated. Published, December, 1929. Price, 25 cents.

*Guide No. 4. The Japanese Garden.* Illustrated. Published, July, 1930. Price, 25 cents.

*Guide No. 5. The Rock Garden.* 28 illustrations. Price, 35 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

# BROOKLYN BOTANIC GARDEN

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# HYBRIDS OF IRIS FULVA AND IRIS FOLIOSA [1]

By George M. Reed

The most outstanding of American species of iris is undoubtedly the copper-flower iris—*Iris fulva*. This plant is unique among all the members of the iris genus on account of the exceptional color of both the sepals and the petals, which have been variously described as red, brick red, copper colored, and terra-cotta. It is, however, very difficult to give an accurate description of the color of the flower, but perhaps the statement that it is deep orange-red, with the appearance of being burnished with copper, will give a fairly definite idea.

This very distinctive iris has some value as a garden plant. Unfortunately, in the north it is not particularly vigorous, and it is also a shy bloomer. Perhaps the greatest value of the iris is due to the fact that it has been hybridized with other related species, and some of the new types produced have great garden usefulness. Apparently, Dykes was the first one to cross *Iris fulva* with *I. foliosa*, obtaining in 1910 a plant which he named Fulvala. Dorothea K. Williamson is another variety which was produced by Williamson in 1918 by hybridizing *I. fulva* with *I. foliosa*. Still more recently, Berry, in California, has obtained good garden plants by crossing *I. fulva* with *I. savannarum*, Cacique being listed in 1925, and Sagamore in 1928.

*Iris fulva* belongs in the Hexagona Group of the iris genus. It is more or less closely related to the species *I. hexagona* and *I. foliosa*, all of which are characterized by an ovary which has six longitudinal ridges, giving a six-sided or hexagonal appearance.

Iris Fulva.—We have already mentioned the most striking feature of this iris, namely, the peculiar color of the flowers. Colored illustrations of the flower have been published in the *Botanical*

[1] Brooklyn Botanic Garden Contributions, No. 59.

*Magazine* for 1812, Plate No. 1496; in *The Genus Iris* (Plate 21, 1913), by Dykes, and in *Addisonia* (Vol. 12, Plate 388, 1927), by Small.

The flower stalks are rather tall and slender, and bear a terminal cluster of flowers well above the leaves. The height of the stalk and the length of the leaves vary greatly with the conditions under which the plant is grown but, under a favorable environment, the flower stalk may be four or more feet in height. There are usually two terminal flowers enclosed in the unequal bracts, one of which is very much longer than the other. One or more lateral flowers are generally produced in the axils of the leafy bracts lower down on the flower stem.

When the flower first opens, the segments droop down, but later become elevated, assuming a horizontal or slightly arching position. The sepals, or falls, and the petals, or standards, are very similar in color, the former being slightly darker and richer in effect. The style-branches are rather narrow, with quite small crests; the tips of the stamens extend out as far as the stigma. These features are well shown in our colored plate.

The ovary has six longitudinal ridges or ribs, which give it a hexagonal appearance. The mature capsule, however, is nearly ellipsoidal, being about two and one-half inches long by one and one-half inches in diameter. It encloses a large number of seeds arranged more or less in two rows in each of the three chambers. The seeds are quite large, pale brown in color, with a thick corky husk. They are more or less flattened, semicircular, and irregular in shape on account of the pressure within the developing pod.

The iris was first described by Ker-Gawler in the *Botanical Magazine* for 1812, and illustrated by colored Plate No. 1496. Ker-Gawler refers to the iris as " An unrecorded and singular species, differing from any known to us in the colour and inflection of the corolla. Found spontaneous on the Banks of Mississippi, in low grounds not far from the town of New-Orleans. Introduced into this country in 1811, by Mr. Lyon, a very intelligent and industrious collector of North-American plants. Hardy. Blossoms in June. Seeds freely, and is easily propagated by dividing the rootstock."

Two years later, Pursh, in his *Flora of North America* (1: 30, 1814), described the same plant as *Iris cuprea,* again referring to

the peculiar color of the flower. He states that it was found, "on the banks of the Mississippi near New Orleans; discovered by Mr. Enslen, Collector to the Prince Lichtenstein of Austria. Flowers of a beautiful copper colour, veined with purple."

Dykes, in *The Genus Iris* (p. 84), gives the distribution of this species as the immediate vicinity of New Orleans. As a matter of fact, it is widely distributed in the Mississippi Valley, and occurs in the swamps from Southern Illinois and Missouri to Louisiana and Georgia. It seems to be particularly abundant in the Coastal Plain of the lower Mississippi. Small, in *Addisonia* (**12**: 7, 1927), describes it as forming numerous large and small colonies in the general vicinity of New Orleans, sometimes occurring in practically pure stands.

Iris Foliosa.—The leafy blue flag, *Iris foliosa,* is of special interest because of the hybrids which have been produced between it and *I. fulva.* This iris has evidently been confused with *I. hexagona,* a large, robust species, found on the Southern Atlantic Coast and along the Gulf of Mexico, usually growing in the rich black loam where there is an abundance of water. It is also late flowering, coming into bloom long after the other irises have ceased to flower.

*Iris foliosa* was apparently first known as *I. hexagona* var. *lamancei,* being recorded as such by Lora S. La Mance and named but not described by Mr. J. N. Gerard (*Garden & Forest,* 1895, 1896). The plant, however, was first clearly distinguished by Mackenzie and Bush in 1902 (*Transactions* of the Academy of Science of St. Louis, **12**: 81), who stated that it, "Grows in dense masses in low open dry woods and prairies in Kentucky, Illinois, Missouri and Kansas. This species is distinguished from *Iris hexagona* Walt., a species of the Southern States, to which it has been referred by Watson and other American botanists, by its smaller pedicelled flowers."

The flower stalk of *Iris foliosa* is short, zig-zag, more or less prostrate and hidden by the leaves. There are usually two terminal flowers, as well as several in the axils of the leafy bracts. The falls are light bluish-purple, except near the base of the blade, where there are numerous white lines on either side of the clear yellow linear ridge which extends down the claw. The standards are light bluish in color, becoming pale, nearly white, towards the

base. The style-branches are greenish white towards the base, with the large crests pale bluish. The flower has been illustrated by Dykes in *The Genus Iris* (Plate 20), and by Small in *Addisonia* (Vol. 9, Plate 315, 1924).

The ovary of *Iris foliosa* is six-angled, or hexagonal, due to the longitudinal ridges. The mature capsule or pod is nearly spherical, about an inch in diameter; it contains relatively few seeds, which are quite large, more or less irregular in shape and size, with a thick corky covering. They are very similar in appearance to those of *I. fulva.*

*Iris foliosa* is a more northern species than *I. fulva,* but the two overlap in a part of their area. The former is doubtless widely distributed in the valley of the Mississippi and its main contributaries. Waller, in the *Ohio Journal of Science* (31: 38, 1931), records it as widely distributed in Ohio. He states that the habitat of the plant is the small stream terraces, succeeding well in partly shaded positions. This iris also differs from *I. fulva* in manifesting a very marked winter habit. The leaves die down in the fall, and the new ones grow very little, if at all, until the following spring. In *I. fulva,* however, the new leaves push up in the autumn and may be of a considerable size during the winter period.

Hybrids of Iris Fulva and I. Foliosa.—Apparently, Dykes was the first one to hybridize these two species, taking the pollen of *Iris foliosa* and placing it upon the stigma of *I. fulva.* From the resulting seeds he grew several seedlings, and one of these he called *I. fulvala,* the name being made up from *fulva* and *lamancei.* According to his description, the color of *I. fulvala* was, "a rich velvety, reddish—almost crimson—purple, becoming yellow towards the center of the flower, the falls bearing a central, deep yellow slightly-raised ridge, which is distinctly pubescent." According to his note in the *Gardners' Chronicle* (48: 2, 1910), it was not until 1910 that the seedlings flowered. From the same pod of seed he obtained another plant which produced flowers of a deep blue-violet color.

In his *The Genus Iris,* published in 1913, Dykes gives a colored illustration on Plate 21 of the flower of *Iris fulvala,* and describes the plant, "as a compromise between the features of the two parents. Thus the foliage neither dies away entirely in autumn like that of *I. foliosa,* nor remains green and of considerable length like

that of *I. fulva.* For the young growths push up soon after the flowers are over and are 4 or 6 inches long in winter, while those of *I. foliosa* are still only 1 in. long, and those of *I. fulva* a foot at least. The stem is more like that of *I. fulva* than like that of the pollen parent, but it is sturdier. The flowers are of the shape of *I. foliosa,* with perhaps more rounded segments, and the colour is distinctly a compromise between the terra cotta of *I. fulva* and the blue-purple of *I. foliosa.* The figure of a flower of *I. fulvala* shows the form in which the influence of the colour of *I. fulva* is most apparent. I have also from the same pod of seed other plants in which the shade of colour has distinctly more of the blue-purple of *I. foliosa* in it."

In 1918, Mr. E. B. Williamson listed a new garden variety of iris under the name of Dorothea K. Williamson, which was obtained from hybridizing *Iris fulva* with *I. foliosa.* This plant is now well known in our gardens, since it has exceptional qualities. It is a very vigorous grower, and produces flowers in great abundance. The leaves are taller than those of either *I. fulva* or *I. foliosa;* the stems are longer than those of *I. foliosa,* and bear several flowers, which may be open at the same time; the stems, however, do not exceed the leaves in height.

The falls remain nearly horizontal. They possess the quality of an iris flower which is described as "substance." The standards spread out in about the same plane as the falls. The color of the flowers matches fairly closely the Hyacinth Violet of Ridgway, on Plate 11 of his *Color Standards and Nomenclature.* The flower differs from Fulvala in that the falls are more pointed and in the bluer tone of the color. The color of Fulvala corresponds very closely to Roods Violet on Plate 11 of Ridgway.

We have also crossed these two species using, however, the pollen from *Iris fulva* on the stigma of *I. foliosa.* The original crosses were made in 1924 and, from the seed obtained, several seedlings were grown. These first flowered in 1927. All the plants had the same general appearance so far as shape and color of the flower were concerned. They manifested a somewhat less rank and vigorous growth as compared with either Fulvala or Dorothea K. Williamson. In shape, the flower was very similar to that of Fulvala, the parts, however, being slightly smaller, and the tips of the falls a little more pointed. The color was not so

richly developed as in Fulvala, corresponding fairly well with the Petunia Violet of Ridgway, a shade differing from the Roods Violet of Fulvala mainly in having more grey in it.

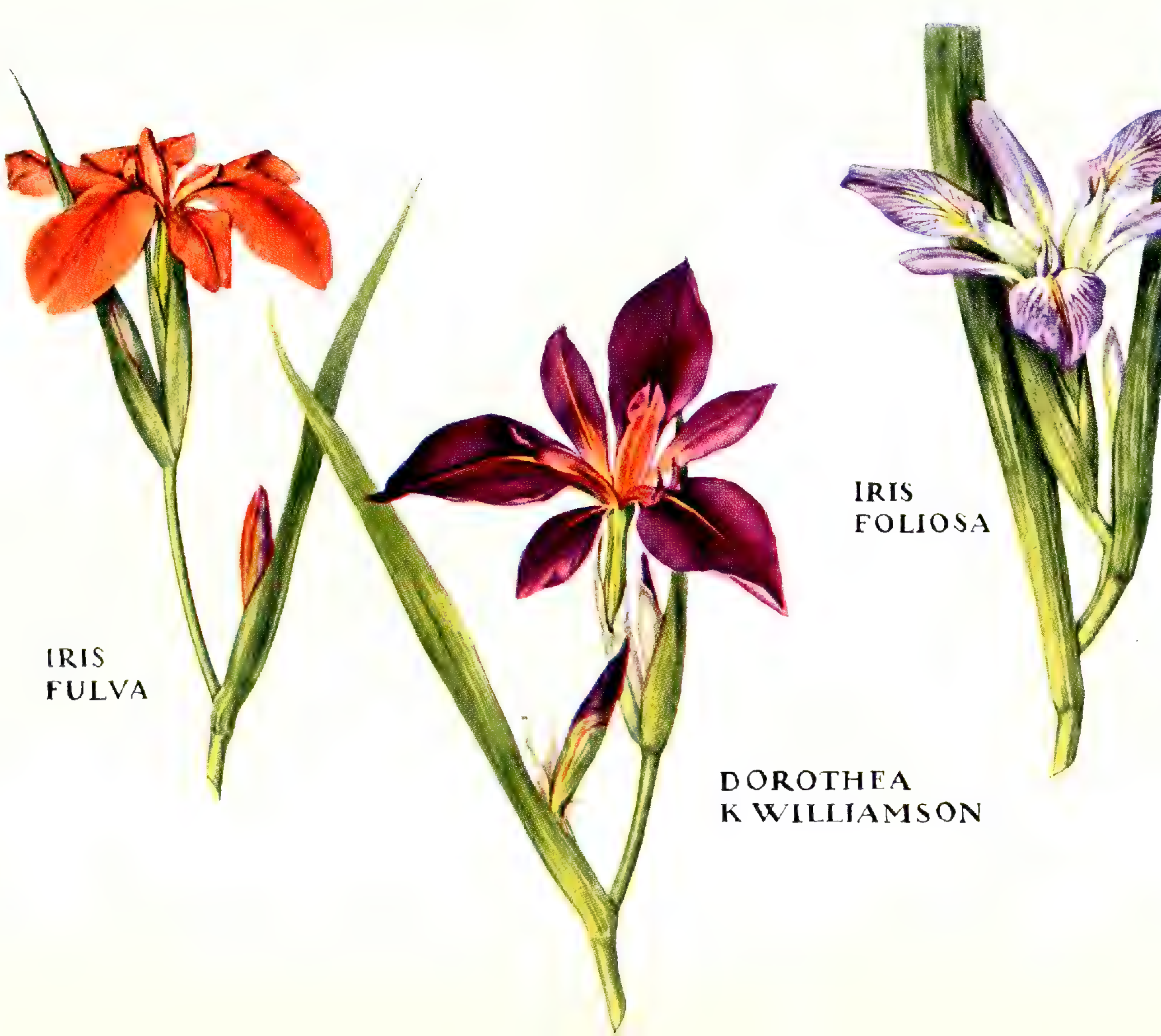
Both the species *Iris fulva* and *I. foliosa* and the three hybrids between them—Fulvala, Dorothea K. Williamson, and our own—are very fertile at the Brooklyn Botanic Garden. A large proportion of the flowers normally set pods in which are well developed seed. The seed also germinates quite readily, although it usually takes several months for the young seedlings to emerge from the soil.

Seedlings of Dorothea K. Williamson.—In 1925 a flower of Dorothea K. Williamson was pollinated with pollen from this same variety and the ripe seed from the pod was carefully saved and planted the same fall. The seed germinated and several seedlings were grown to the flowering stage. Four of these first blossomed in 1928, and these same ones, with two additional plants, produced flowers in 1929.

The plants were all more or less similar in their general features. They resembled somewhat closely the *Iris foliosa* grandparent. There were minor differences between the plants in the height, width, and color of the leaves. The flower stems were short, more or less zig-zag, and hidden, or nearly so, by the leaves. Most of the plants lacked the characteristic vigor of their immediate parent, Dorothea K. Williamson. None of them showed any approach to the tall slender habit of *I. fulva*.

The most striking thing about all of these plants was the great variation in the size, shape, and color of the flowers. Five distinct plants were numbered and described and colored figures of the flowers are shown in the plate.

*Plant No. 1.*—The flower of this plant shows marked similarity to that of its immediate parent, Dorothea K. Williamson, the parts having the same general shape and position. The falls are relatively narrow and pointed; the standards are also narrow and lanceolate; the bases are white, this color extending part of the way up the central portion. The style-branches are white, or nearly so, except at the tips, where there are some purple areas on the crests. The color of both the falls and standards is slightly more blue-purple in tone as compared with Plant No. 2.



IRIS
FULVA

IRIS
FOLIOSA

DOROTHEA
K WILLIAMSON

FIVE SEEDLINGS OF DOROTHEA K WILLIAMSON

As a flower, it is decidedly inferior to Plant No. 2, and also to Dorothea K. Williamson. This is due mainly to the narrower, more pointed floral parts. The plant is also dwarf, with comparatively short leaves and flower stems.

*Plant No. 2.*—The flower is quite suggestive of Dorothea K. Williamson, the falls, standards, and style-branches having about the same color tones. The poise of the floral parts is also very similar, the falls and standards being fairly rigid and extending horizontally or nearly so. The falls, however, are narrower and more pointed as compared with Dorothea K. Williamson, and thus give the flower a smaller, more slender effect. The standards are also narrower and spatulate rather than oblanceolate. The style-branches have more of a dull greenish purple color towards the base, becoming a brighter purple on the crests.

*Plant No. 3.*—The flower of this plant is a curious mixture of yellow and light blue-purple. The poise of the flower is about the same as in Dorothea K. Williamson. The blade of the falls is broader, more elliptical, and not so pointed. The distribution of the color in the falls suggests that of the original *Iris foliosa* parent except for the fact that the white at the base of the blade of the fall of the parental species is replaced by yellow. The blue color is not so clear, being a mixture of a bluish purple with the yellow. The standards are oblanceolate, bluish purple, somewhat darker than the falls, and distinctly yellowish towards the base. The crests and tips of the style-branches are reddish purple, the latter becoming greenish yellow to green at the base. The flower is very distinctive, but shows its relationship to the original *I. foliosa* parent. The plant is quite vigorous and floriferous; it spreads more rapidly than any of the other seedlings, and may have some value in the garden.

*Plant No. 4.*—The flower of this plant in some ways is the most unusual of all on account of its bright yellow color. It is perhaps surprising that a yellow flowered plant could be descended from *Iris fulva* and *I. foliosa* through Dorothea K. Williamson. The shape of the floral parts and the poise of the flower are somewhat similar to that of *I. fulva,* both the falls and the standards having an arching, or a drooping position. The style-branches are greenish yellow at the base, becoming brighter towards the tips and on the crests, the latter being very slightly blotched with reddish

purple. The entire plant suggests a dwarf, more narrow-leafed *I. foliosa,* with a yellow flower of the general shape of *I. fulva.*

*Plant No. 5.*—The flower color of this plant is very exceptional, matching quite closely the Mallow Purple of Ridgway (Plate 12). The more usual terms of cerise and old rose have also been applied to describe the color. The poise of the flower and the shape of the parts are very similar to that of Dorothea K. Williamson. The falls are somewhat narrower and more pointed, and the standards are oblanceolate, similar in color to the falls, with the same Mallow Purple prevailing in the style-branches and crests. It is clearly an outstanding flower, and is perhaps the most promising one of the seedlings. The plant, however, lacks the vigorous growth of Dorothea K. Williamson, and the flower stem is shorter and more concealed by the leaves.

Seedlings from Promiscuous Crossings.—During the present season a large number of seedlings have bloomed for the first time. The seed parent of all of these plants was recorded but for the most part open pollination occurred and, consequently, the male parent was unknown. Many plants of *Iris fulva, I. foliosa,* Dorothea K. Williamson, Fulvala, and our own first generation plant of the species cross were growing in a bed close together, and it was possible for pollen from any one of these to be carried to the flowers of any other.

Undoubtedly cross pollination involving these different plants has occurred, and the result is that the seedlings show a remarkable array of variation in form and color. Many of the plants have a flower similar in shape to that of Dorothea K. Williamson, while in others the form and poise of the flower approach *Iris fulva* or *I. foliosa.* The plants also vary a great deal in their vigor, involving marked differences in the length and breadth of the leaves and the height of the flower stem.

A good many of the seedlings produced flowers more or less resembling those of Plants No. 1 and 2 as described above. They showed different shades of bluish purple, combined with variations in shape. Other seedlings had flowers with various shades of reddish purple; some of these, in shape and poise, approach Dorothea K. Williamson, while others had a remarkable resemblance to *Iris fulva.*

Several seedlings with a distinct yellow color appeared. Most of these had some touch of reddish purple in either the standards or the style branches, and in some cases a flush of pink occurs on the otherwise yellow falls. Some of these are similar in form and poise to Dorothea K. Williamson and, consequently, quite unlike Plant No. 4 as described above.

The flowers of a number of seedlings resembled rather closely Plant No. 5 as described above. These differed, however, in the tint of the color, some being much darker than others. Most of them had the general shape of Plant No. 5.

Among all these seedlings there were several very promising plants, and one in particular was outstanding. It was a vigorous plant with a rather tall stem, bearing many flowers; the flowers were rather large, of good substance, and the general poise of *Iris fulva*. The color, however, was a dark red; the color of the falls matched rather closely the Aster Purple of Ridgway. The standards were somewhat lighter, being Liseran Purple to Magenta. From a distance the plant stood out prominently on account of its unusual red appearance.

Production of New Varieties of Iris.—Most garden varieties of iris have originated from the crossing of two plants differing in one or more characters. The new individuals grown from the seed, if they are worth while, are propagated by the division of the rhizome, and in this way the new type is rapidly increased. Such hybrid plants, however, do not breed true from seed and, when such a garden variety is self-pollinated, additional new types of greater or less value may be obtained from the seedlings grown.

There are many records of crosses having been made between distinct species of iris. The immediate plant resulting from such a cross is the one that is generally grown and, if it possesses valuable characteristics, it is increased by the common method of vegetative propagation of the rhizome. As long as the plant is reproduced in this manner, it retains quite definitely all of its characteristics. If, however, such a hybrid plant is permitted to produce seed and the young seedlings are grown to maturity, many new types combining the various features of the original parents may be found among the offspring, since the segregation and recombination of characters familiar to plant breeders occurs in this particular generation.

The crossing of species which differ in many characters offers unusual possibilities in the production of new varieties. First generation plants are more or less similar, and may be propagated indefinitely. It is interesting to note, however, that Fulvala, Dorothea K. Williamson, and our own first generation hybrid plants, differ in some important points from each other, although they are all hybrids between the same two species—*Iris fulva* and *I. foliosa.* The differences in these first generation plants may be due to the fact that different strains or local races of one or both parental varieties may have been used in making the original crosses.

Our results with growing the second generation plants from self-pollinated seed of Dorothea K. Williamson are conspicuous evidence of exceptional opportunities in the production of new types of iris. The various characters of the original parental species are recombined in all sorts of new ways, various colored flowers on different types of plants being obtained. We have described and illustrated only a few of the possible kinds. Many further combinations may be found when additional seedlings are grown to maturity. In such a cross, involving marked differences between the original species, a large series of new forms may thus be secured.

There are still further possibilities in crossing the first generation plant with either of its parents. Such crosses are known to the plant breeder as "back crosses" and, in this particular case, we might expect to obtain exceptional results by hybridizing the first generation plant, as Dorothea K. Williamson, with the *Iris fulva* parent.

*Iris fulva* undoubtedly offers many opportunities for the production of new kinds of iris. If it is hybridized with tall and more vigorous types than *I. foliosa,* very desirable varieties might be secured, in which the height and vigor of one parent would be combined with flowers of exceptional coloring, size, poise, and substance. The possibilities of such results are indicated by Cacique and Sagamore, obtained by Dr. S. S. Berry, in which, apparently, *I. fulva* has been hybridized with *I. savannarum.* Many additional seedlings of our own crosses are also being grown, and the future possibilities are practically unlimited.

## *The Colored Plate* [2]

The colored plate is made from the original watercolor drawings by Miss Louise B. Mansfield. On the upper half of the plate there are grouped the tips of the flower stalks of the two parental species, *Iris fulva* and *I. foliosa,* and the first generation plant, Dorothea K. Williamson. On the lower half of the plate are shown the drawings of five seedlings from a selfed flower of Dorothea K. Williamson. These belong to the second generation of hybrids.

The figures show the characteristic shape, color, and poise of the flowers. They are all reduced one-half in reproduction. The characteristic differences of the original parental species, the first generation plant, and the five second generation plants, are well shown.

[2] The colored plate illustrating this paper is published with the aid of a gift from the Woman's Auxiliary of the Brooklyn Botanic Garden.

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## GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, Brooklyn, N. Y.* Telephone, 6173 Prospect.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard (Malbone Street), and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Montgomery Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one week in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

[1] Resigned as of June 30, 1931.
[2] Beginning July 1, 1931.

# PUBLICATIONS

OF THE

# BROOKLYN BOTANIC GARDEN

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly beginning with 1929. Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.50 a year. Circulates in 41 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* comprising 33 scientific papers presented at the dedication of the laboratory building and plant houses, April 19–21, 1917. 521 pages. Price $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. Price $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor, June 10, 1927. 151 pages. Price $1.60.

CONTRIBUTIONS. Established, April 1, 1911. Papers originally published in periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume. Circulates in 34 countries.

*55. Physiologic races of bunt of wheat.* 14 pages. 1928.

*56. The inheritance of resistance of oat hybrids to loose and covered smut.* 48 pages. 1928.

*57. New physiologic races of oat smuts.* 22 pages. 1930.

*58. A new method of producing and detecting sorghum hybrids.* 12 pages. 1930.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record;* see above.

*Guide No. 3. The story of our metate: A chronicle of corn.* Illustrated. Published, December, 1929. Price, 25 cents.

*Guide No. 4. The Japanese Garden.* Illustrated. Published, July, 1930. Price, 25 cents.

*Guide No. 5. The Rock Garden.* 28 illustrations. Price, 35 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

# BROOKLYN BOTANIC GARDEN RECORD

VOL. XX SEPTEMBER, 1931 NO. 5


## PROSPECTUS

OF COURSES, LECTURES, AND OTHER EDUCATIONAL
ADVANTAGES OFFERED TO MEMBERS AND TO
THE GENERAL PUBLIC

## 1931-32


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# GENERAL INFORMATION ABOUT THE NATURE AND ACTIVITIES OF THE BROOKLYN BOTANIC GARDEN

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

By an Agreement with the City of New York, the functions of the Garden have been defined as two-fold, and may be summarized as follows: first, the advancement of botanical science through original research; and second, the dissemination of a knowledge of plants.

The first of these activities is carried on by director, curators, resident investigators, fellows, and others, who devote all or a part of their time to independent investigation.

The second, the dissemination of botanical knowledge, is accomplished in the following ways:

I. By the teaching of classes—
   a. of children who come voluntarily outside of school hours;
   b. of children who come with their teachers from public and private schools for special lessons on plant life and closely related subjects;
   c. of adults who are interested in some phase of pure or applied botany.

II. By lectures at schools and elsewhere by the various staff members.

III. By broadcasting.

IV. By loan sets of lantern slides accompanied by lecture text, for use in the schools.

V. By the distribution to schools of study material for classes in botany, biology, and nature study.

VI. By public lectures and educational motion pictures at the Botanic Garden.

VII. By maintaining labelled collections of living plants, arranged systematically and otherwise on the grounds and in the Conservatories of the Garden.

VIII. By the herbarium, containing specimens of preserved plants from all parts of the world.

IX. By maintaining a reference library on plant life and related subjects, open free to the public daily (except Sundays and holidays).

X. By the following periodicals, published by the Botanic Garden:

1. American Journal of Botany.
2. Ecology.
3. Genetics.
4. Brooklyn Botanic Garden Record, including Guides.
5. Leaflets.
6. Contributions.
7. Memoirs.

XI. By popular and technical articles in journals and the public press.

XII. By the maintenance of a Bureau of Public Information on all phases of plant life.

XIII. By providing docents to accompany members and others who wish to view the collections under guidance.

XIV. By cooperating with City Departments and other agencies in the dissemination of botanical knowledge.

The Brooklyn Botanic Garden is also taking an active part in the movement for the conservation of our native American plants.

A brief summary and report of the public educational work of the Garden from 1910 to 1928, with some attempt to set forth the fundamental principles upon which it is based, was published in the Brooklyn Botanic Garden Record for July, 1929. On request, copies will be sent gratis to those engaged in educational work.

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BROOKLYN BOTANIC GARDEN RECORD

VOL. XX SEPTEMBER, 1931 NO. 5

# PROSPECTUS: 1931–32

## I. COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters pertaining to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration, methods, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, find the collection of useful plants in the economic plant house, and also the Japanese Garden, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under guidance. Illustrated lectures for geography classes may also be arranged for at the Garden.

The systematic collection in the main part of the Garden, where the living plants are arranged by orders and families, is proving of great value for demonstration to visiting high school classes in botany.

**A. Talks at Schools.**—The principals of public or private schools may arrange to have lantern talks given at the schools on various topics related to nature study, such as garden work with children, tree planting, the conservation of wild flowers, and Arbor Day. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

**B. School Classes at the Garden.**—(*a*) Schools not provided with a stereopticon, and other schools, may arrange for classes, accompanied by their teachers, to come to the Botanic Garden for lectures either by the teacher or by a member of the Garden Staff.

(*b*) Notice of such a visit should be sent at least *one week* previous to the date on which a talk is desired. Blank forms are provided by the Garden for this purpose. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Fall and spring announcements of topics will be issued during 1931–32.

(*c*) The Garden equipment, including greenhouses, plant material, lecture rooms, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance so that such work will not conflict with other classes and lectures. For High School classes address the *Curator of Public Instruction.* For Junior High and Elementary School classes address the *Curator of Elementary Instruction.*

(*d*) The principal of any elementary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given during the fall or spring to a class. A small fee is charged to cover the cost of the materials used. The plants raised become the property of the pupils. The lessons will be worked out for the most part in the greenhouse, and the class must be accompanied by its teacher. This is adapted for pupils above the third grade.

**C. Lectures for High School, Junior High School, and Teachers' Training School Students.**—To supplement biology studies in the schools of Brooklyn, a series of late afternoon lectures will be held in the spring of 1932, arranged especially for high school students. The subjects will be selected from among those in the New York Biology Syllabus, and will follow as closely as possible the sequence of that outline of study. When entire classes attend, it is recommended that they be accompanied by their teachers. Announcements of topics will be issued early in 1932.

**D. Seeds for School and Home Planting.**—Penny packets of seeds are put up by the Botanic Garden for children's use. In the early spring, lists of these seeds, order blanks for teachers and pupils, and other information may be secured on application to the *Curator of Elementary Instruction.*

**E. Conferences.**—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gardening and nature study. Appointments must be made in advance. Address the *Curator of Elementary Instruction.*

**F. Study and Loan Material.**—To the extent of its facilities, the Garden will provide, on request, various algae and protozoa, as well as living plants, leaves and twigs, and other plant parts for study. When containers are necessary, as in the case of the algae and protozoa, they must be furnished by the school. In all cases arrangements must be made by the teachers for calling for such material. It will greatly aid in the speed and efficiency of service if teachers will write or telephone a day in advance of sending for material.

For the following, address, by mail or telephone (Prospect 9–6173), Miss Hester M. Rusk.

1. Algae:
   Pleurococcus
   Spirogyra
   Vaucheria
   Desmids
   Blue-green algae: Oscillatoria and others.
2. Types of fungi and lichens.
3. Liverworts: Conocephalus and Lunularia.
4. Moss plants: protonema, " felt," and capsules.
5. Ferns:
   Prothallia: for these a covered Petri dish or tin box should be sent.
   Fronds with spores.
6. Elodea or Nitella—to show movement of protoplasm.
7. Corn or sorghum stems, dried.
8. Twigs of maple, basswood, ailanthus, and others.
9. Simple and compound leaves.
10. Various seeds and fruits to illustrate methods of dispersal.
11. Specimens loaned for exhibit: e.g., leguminous roots with tubercles, plant diseases, modified leaves, demonstrations of Mendelism.
12. Protozoa: Paramoecium, Euglena, and others.
13. Sterilized nutrient agar for the study of bacteria and molds.

This agar will be furnished in bottles; or, if teachers will send in their own Petri dishes, *clean and dry,* at least one week in advance, these will be filled ready for use.

For the following, address, by mail or telephone (Prospect 9--6173), Miss Margaret M. Dorward. Messengers should call for this material at the Information Booth on the ground floor.

14. Geranium, Coleus, Tradescantia—variegated green and white, loaned for photosynthesis experiment.
15. Cacti, pitcher plant (*Sarracenia*), Selaginella, sensitive plant (*Mimosa pudica*), Venus Fly-tray (*Dionaea muscipula*), and others—loaned for demonstration.
16. Mounted specimens of leaves of trees mentioned in the Syllabus of Nature Study.
17. In spring time, for school gardens, the surplus supply of seedlings from Botanic Garden classes.

**G. Demonstration Experiments.**—Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction.*

**H. Loan Sets of Lantern Slides.**—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short lecture text of explanatory nature. In all cases these sets must be called for by a school messenger and returned promptly in good condition. Address, by mail, or telephone, Mr. Frank Stoll. The subjects now available are as follows. Other sets are in preparation.

1. Plant Life
2. Spring Wild Flowers
3. Common Trees
4. Fall Wild Flowers
5. Forestry (2 sets)
6. Conservation of Native Plants

## II. BUREAU OF PUBLIC INFORMATION

Each year hundreds of requests for information about plants are answered by the various members of the Garden staff, per-

sonally, by mail, or telephone. These questions, many of them most unusual and interesting, extend into practically every field of pure and applied botany, and the information sought is gladly given wherever possible. Inquiries should be directed to the *Curator of Public Instruction,* preferably by letter. If the identification of plants is desired, it is best to enclose as large a specimen as possible of the plant in question. If diseased plants are concerned it is advisable to enclose a representative specimen of the part diseased.

## III. DOCENTRY

To assist members and others in studying the collections the services of a docent may be obtained. Arrangements should be made by application to the Curator of Public Instruction one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see page 3 of the cover of this PROSPECTUS.

## IV. TEACHING STAFF

RALPH HOLT CHENEY, Sc.D., Resident Investigator (Economic Plants).

B.S., Boston University, 1918; A.M., 1919; M.S., Harvard, 1922; Sc.D., 1923; Assistant in Zoology, Radcliffe College, 1921; Assistant in Botany, Harvard, 1922; Instructor in Zoology, Western Reserve University, 1923; Assistant Professor of Biology, New York University, 1924–1929; Professor of Biology and Chairman of the Biology Dept., Long Island University, 1929–.

MARGARET MAXWELL DORWARD, A.B., Acting Assistant Curator of Elementary Instruction.

A.B., Smith College, 1927; Assistant in Botany, Smith College, 1928; Instructor, Brooklyn Botanic Garden, 1930; Acting Assistant Curator of Elementary Instruction, Brooklyn Botanic Garden, 1930–.

MONTAGUE FREE, Horticulturist.

Botanic Garden, Cambridge, England, 1899–1906; Warley Place Gardens, England, 1906–1908; First Class Certificate, Royal Hor-

ticultural Society, 1910; Royal Botanic Gardens, Kew (Certificate), 1908–1912; Dept. of Floriculture, N. Y. State College of Agriculture, Ithaca, N. Y., 1912–1913; Instructor in Floriculture, School of Horticulture for Women, Ambler, Penna., 1913; Head Gardener, Brooklyn Botanic Garden, 1914–1920; Horticulturist and Head Gardener 1920–1924; Horticulturist, 1924–.

Arthur Harmount Graves, Ph.D., Curator of Public Instruction.

A.B., Yale, 1900; Ph.D., 1907; University of London, 1914–1915; Assistant in Botany, Sheffield Scientific School and Yale School of Forestry, 1902–1904; Instructor in Forest Botany, Yale School of Forestry, 1904–1906; Instructor in Botany, Sheffield Scientific School, 1906–1909; Assistant Professor, 1909–1914; Associate Professor of Biology, Connecticut College for Women. 1916–1917; Pathologist and Collaborator, Office of Investigations in Forest Pathology, U. S. Department of Agriculture, 1918–; Curator of Public Instruction, Brooklyn Botanic Garden, 1921–.

Alfred Gundersen, Docteur de l'Université (Paris), Curator of Plants.

A.B., Stanford University, 1897; A.M., Harvard University, 1907; Docteur de l'Université, Paris, 1910; Teacher, secondary schools, Boston, Mass., 1898–1903; Assistant, Arnold Arboretum, 1910–1913; Herbarium Assistant, Brooklyn Botanic Garden, 1914–1915; Assistant Curator of the Herbarium, 1916–1919; Associate Curator of Plants, 1920–1924; Curator of Plants, 1924–.

H. Dorothy Jenkins, A.B., Instructor.

A.B., Mt. Holyoke College, 1927; Assistant, Newark Museum, 1929–1930; Instructor, Brooklyn Botanic Garden, 1930–.

Frances M. Miner, A.B., Instructor.

A.B., Smith College, 1927; Local Director, Elmira Council Girl Scouts, Elmira, N. Y., 1927–1930; Director, Elmira Girl Scout Camp, 1928–1930; Instructor, Brooklyn Botanic Garden, 1930–.

George Matthew Reed, Ph.D., Curator of Plant Pathology.

A.B., Geneva College, 1900; A.M., University of Wisconsin, 1904; Ph.D., 1907; Professor of Natural Science, Amity Col-

lege, 1900–1903; Assistant in Botany, University of Wisconsin, 1904–1907; Instructor, 1907; Assistant Professor of Botany, University of Missouri, 1907–1912; Professor, 1912–1918; Pathologist, U. S. Department of Agriculture, 1919–1920; Curator of Plant Pathology, Brooklyn Botanic Garden, 1921–.

Hester M. Rusk, A.M., Instructor.

A.B., Columbia University, 1912; A.M., 1917; Instructor in Botany, Nebraska University Agricultural High School, 1913–1915; Assistant in Botany, Barnard College, 1915–1918; Instructor, 1918–1920; Technical Assistant, New York Botanical Garden, 1920–1926; Curatorial Assistant, Brooklyn Botanic Garden, 1926–1927; Instructor, 1928–.

Ellen Eddy Shaw, B.S., Curator of Elementary Instruction.

B.S., Tufts College, 1902; Tufts Medical School, 1902; Supervisor of Nature Study and Head of Science Dept., High School, Wayland and Cochituate, Mass., 1902–1905; Supervisor of Nature Study Dept., State Normal School, New Paltz, N. Y., 1905–1906, 1907–1909; Supervisor of Nature Study, Rochester City Training School, 1905–1907; Lecturer in Nature Study, State Board of Education, New York, 1907–1910; Teacher of Nature Study, Winthrop College Summer School, Rock Hill, S. C., 1910–1911–1912; Supervisor of Nature Study, Ethical Culture School, New York City, 1910–1913; Lecturer in Spring Garden Course at Pratt Institute Kindergarten, 1912–1916; Lecturer in Nature Study, State Board of Education, West Virginia, 1912; Curator of Elementary Instruction, Brooklyn Botanic Garden, 1913–.

Henry K. Svenson, Ph.D., Assistant Curator of Plants.

A.B., Harvard University, 1920; A.M., 1922; Ph.D., 1928; Assistant, Arnold Arboretum, 1920; Instructor in Biology, Union College, 1922–1925; Assistant Professor, 1925–1927; Assistant in Gray Herbarium, Harvard University, 1928–1929; Editorial Work on Biological Abstracts, 1929; Assistant Curator of Plants, Brooklyn Botanic Garden, 1930–.

## V. COURSES OF INSTRUCTION

Courses of instruction are offered in Botany, Gardening, and Nature Study, and are divided into 4 classes:

A. For the general public (" A " courses, p. 263)
B. For teachers (" B " courses, p. 266)
C. For children (" C " courses, p. 268)
D. Other courses of a special nature (" D " courses, p. 271)

*No course will be given when less than ten persons apply for registration.* Since registration in many of the courses is restricted to a fixed number on account of the limited space available in the greenhouses, and for other reasons, those desiring to attend are urged to send in their application for enrollment and the entrance fee to the Secretary, Brooklyn Botanic Garden, several days in advance of the first exercise. This avoids delay at the beginning of the first exercise, ensures a place in the course, and enables the instructor to provide adequate material for the class.

The following equipment is available for the courses:

1. Three *Classrooms* (in addition to the Boys' and Girls' Club Room in the Laboratory Building), equipped with stereoscopes and views, a stereopticon, plant collections, economic exhibits, models, and other apparatus and materials for instruction.

2. Two *Laboratory Rooms,* with the usual equipment for plant study.

3. *The Instructional Greenhouses,* three in number, for the use of juvenile as well as adult classes for instruction in plant propagation and related subjects.

4. *The Children's Garden,* on a piece of land about three-quarters of an acre in extent, in the southeast part of the Botanic Garden, divided into about 150 plots which are used throughout the season for practical individual instruction in gardening.

5. *The Children's Building,* near the north end of this plot, containing rooms for conferences and for the storage of tools, seeds, notebooks, special collections, etc.

6. The *Auditorium,* on the ground floor, capable of seating 570 persons, and equipped with a motion-picture lantern and stereopticon.

In addition to these accommodations, the dried plant specimens in the herbarium, the living plants in the conservatories and plantations, and the various types of gardens are readily accessible, while the main library and children's library, which contain a comprehensive collection of books on every phase of gardening

and plant life, may be consulted freely at any time. See also pages 274–278.

## A. Courses for the General Public

The following courses are open to any one who has a general interest in plants. Teachers are welcome. Unless otherwise specified they are *free to members of the Botanic Garden;** for others a small fee is required, as indicated.

### 1. *Fall Courses*

**A4. Gardening in the Fall.**—Five lessons, with practical work in the greenhouse, on the methods of making cuttings, the various kinds of bulbs for fall planting, their treatment and care, the proper management of house plants, and a discussion of the kinds suitable for cultivation. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee, $5. Mondays,* 4 p.m., *October 5 to November 9. (Omitting October 12.)* Mr. Free.

**A5. Trees and Shrubs in their Winter Condition.**—Eight outdoor lessons in the parks and woodlands of Greater New York on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. *Fee, $4. Saturdays,* 2:30 p.m., *October 3 to December 5. (Omitting October 10 and November 28.)* Dr. Graves.

**A13. Flowering Plants of Greater New York: Fall Course.**—Three sessions. Field identification of the flowering plants of Greater New York, with special reference to fall-flowering species and methods of seed dispersal. *Fee, $1.50. Saturdays,* 2:30 p.m., *September 26 to October 17. (Omitting October 10.)* Dr. Svenson and Miss Rusk.

**A19. Ornamental Shrubs: Fall Course.**—Eight outdoor trips in the Botanic Garden and in Prospect Park for the purpose of becoming acquainted with the common species and varieties of cultivated shrubs. This is a continuation of the spring course

* For information concerning membership in the Brooklyn Botanic Garden consult the third page of the cover of this PROSPECTUS.

and includes a study of the fruits. *Fee, $4. Wednesdays,* 4:10 p.m., *September 30 to November 18.* Dr. Gundersen.

**A20. Advanced Course in Gardening.**—Ten lessons. This course presupposes a knowledge of the elements of gardening equivalent to that contained in courses A1 and A4. It consists of lectures illustrated with lantern slides and living material, and includes frequent tours in the Botanic Garden where the various types of gardens and other subjects of the lectures will be demonstrated. The subjects treated are as follows:

Oct. 22. Water Gardens
" 29. Rock Gardens
Nov. 5. Perennial Gardens
" 12. Rose Gardens
" 19. Trees and Shrubs
Dec. 3. Iris—Dr. Reed
" 10. Insect Pests
" 17. Diseases of Herbaceous Plants—Dr. Reed
Jan. 7. Diseases of Trees and Shrubs—Dr. Graves
" 14. Plant Breeding—Dr. Reed

*Fee, $20.00. Single periods,* $2.50 *each. Members of the Garden* are entitled to a 50 per cent. discount. *Thursdays,* 3:30 p.m. *to* 5 p.m. *October 22 to January 14.* Mr. Free, unless otherwise indicated. Mr. Free, Dr. Reed, and Dr. Graves.

**A21. Backyard City Gardens.**—Five lessons for the city gardener. A course planned for those who must work in restricted areas. The work is practical and the material used will become the property of the student. The topics are as follows:

Sept. 29. The Outdoor Bulb Bed
Oct. 6. Checking up the Perennial Garden
" 13. Taking up House Plants
" 20. Roses and other Shrubs—Fall Planting
" 27. Potting of Bulbs for Indoor Bloom

*Fee, $10. Tuesdays,* 2 p.m., *September 29 to October 27. Members of the Garden* are entitled to a 50 per cent. discount.
Miss Shaw.

## 2. *Spring Courses*

**A1. Plants in the Home.**—How to grow them. Five talks with demonstrations. Practice in potting, mixing soils, making cuttings, etc. This course deals with the principles to be followed in raising plants. The members of the class have the privilege of keeping the plants they have raised. *On account of restricted space in the greenhouse, this class must be limited to 40. Registration according to the order of application. Fee, $5. Fridays,* 4 p.m., *February 26 to March 25.* Mr. Free.

**A8. Plant Families.**—Eight outdoor lessons in the Botanic Garden, taking up the structure and possible lines of evolution of flowers and the characteristics of the more important plant families, such as the Magnolia, Buttercup, Mustard, Pink, Rose, Plum, Apple, Geranium, Mallow, Carrot, Dogwood, Heath, Potato, Figwort, Mint, and Composite Families. *Fee, $4. Tuesdays,* 4 p.m., *April 12 to May 31.* Dr. Gundersen.

**A9. Trees and Shrubs of Greater New York.**—Ten outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, and the features pointed out by which they may be most easily recognized; also their habits, rate of growth, economic value and use, methods of planting and propagation; importance in forestry, horticulture, and landscape art. *Fee, $5. Saturdays,* 2:30 p.m., *April 2 to June 11. (Omitting May 28.)*

Dr. Graves.

**A18. Ornamental Shrubs.**—Eight weekly field trips dealing with the shrubs used in ornamental planting, their habits, uses, and botanical relationships. The classes are held out-of-doors, weather permitting, in the Botanic Garden and in Prospect Park. *Fee, $4. Wednesdays,* 4 p.m., *April 20 to June 8.* Dr. Gundersen.

**A11. Flowering Plants of Greater New York: Spring Course.**—A field course of eight lessons in the parks and woodlands of Greater New York. The common native and naturalized wild flowers are studied as they come into flower, and their distinguishing features pointed out. *Fee, $4. Saturday*

*afternoons; April 16 to June 11.* (*Omitting May 28.*) Dr. Svenson and Miss Rusk.

**A16. Plant Geography.**—A course of six lectures and conferences on the chief geographic areas of the eastern United States, and their representative vegetation, with occasional excursions Saturday afternoons. *Fee, $3.* (*Not offered in 1932.*)

Dr. Svenson.

**A22. Theory and Practice of Children's Garden Work.**—Five sessions. This course is planned for parents and others interested in children's gardening. Practical work will be done by members of the class similar to that given to children at the Brooklyn Botanic Garden, and the psychological basis for such work will be discussed. *Fee, $5. Alternate Thursdays,* 4 p.m., *April 7 to June 2.*

Miss Shaw and Miss Jenkins.

## B. Courses for Teachers: Given in Cooperation with the Brooklyn Teachers Association

These courses have been accepted by the Brooklyn Teachers Association, and appear in its Syllabus of Courses. On satisfactory completion of each course, the student is awarded a certificate by the Brooklyn Teachers Association, in cooperation with the Brooklyn Botanic Garden. The courses are also accepted by the New York Board of Education for credit toward higher teaching licenses, one credit being granted for each 15 hours (with the exception of "B8, Plant Culture"). Credits may also be used toward advanced standing in colleges or universities. Through an agreement made in January, 1931, with Long Island University, undergraduate credit for these courses will be allowed toward fulfilling the requirements for a university degree, provided the admission requirements at the University and the laboratory requirements have been fulfilled. Nature materials used in the courses, and plants raised become the property of the student.

*Members of the Garden* are entitled to a 50 per cent. discount from the regular fee for all "B" courses; from other persons the indicated fee is required. *No course will be given when less than ten persons apply.*

**B1. General Botany (B).**—A two-year course, of thirty sessions each year, on the structure and functions of plants. The

first year (**A**) is spent on seed plants. The second year (**B**) the lower groups are dealt with—bacteria, algae, fungi, lichens, mosses, ferns, their life histories and relationships. Optional laboratory work each week with the compound microscope. For the year 1931–32 the latter half of the course (**B**) will be taken up. The first half is, however, not a prerequisite for the second. Students may elect either or both parts of the course, which are given in alternate years. *Fee, $5* each year. *Laboratory fee, $5. Thursdays,* 4 p.m., beginning *October 1.*

Miss Rusk.

**B2. Nature Study.**—Thirty sessions. This course is based on the New York City outline of nature study for grades three to six inclusive. Mounts, charts, and diagrams are made. The student becomes familiar with actual material. The course is entirely practical, work being done in both field and laboratory. *Fee, $10. Tuesdays,* 4 p.m., beginning *October 6.*

Miss Shaw and Miss Miner.

**B3. Principles of Agriculture and Horticulture.**—Thirty sessions. This course is especially helpful to teachers. The principles of horticulture are considered and applied in a practical way through greenhouse, laboratory, and lecture work. The greenhouse work includes the following subjects: plant propagation by means of bulbs, rhizomes, roots, seeds, etc.; the care of the greenhouse; house plants; window-box materials; fertilizers. Insect and fungous pests, grafting, and pruning are also included from both a practical and a theoretical point of view. *Class limited to 60 members. Fee, $15. Wednesdays,* 4 p.m., beginning *September 30.* Miss Shaw, Miss Dorward and Mr. Free.

**B4. Pedagogy of Botany and Educational Principles of Children's Gardening and Nature Study.**—(*Not given in 1931–32.*)

**B5. Children's Garden Practice.**—Fifteen sessions. This course is entirely practical and includes all the outdoor work of the student in his own garden, applying the principles of agriculture and gardening, and work with children in the garden. Open only to those who have taken the spring course in 1930. (*Not offered in 1931–32.*) Miss Shaw and Miss Dorward.

**B6. Field Botany.**—Thirty sessions. This is mainly an outdoor course, given in the Botanic Garden and Prospect Park, hav-

ing for its chief object an acquaintance with the plants one meets with commonly in Greater New York and vicinity, including seed plants (trees, shrubs, and herbs), ferns, mosses, hepatics, algae, and fungi. *Fee, $10. Wednesdays,* 4 p.m., beginning *September 30.* Dr. Graves and Miss Rusk.

**B7. Greenhouse Work.**—Thirty sessions. A course for those interested in the propagation and care of house plants. Lessons in repotting ferns; forcing blooming plants; shaping plants; plant insects and diseases; making window boxes, Wardian cases, and desert gardens—all carried on in the greenhouses. Emphasis will be laid on problems of a practical nature. Limited to those who have taken B3 and planned to follow this course. *Fee, $15. Mondays,* 4 p.m., beginning *October 5.* Miss Dorward.

**B8. Plant Culture.**—A course of twenty weeks duration for those who have taken B3 and B7. *No credits are given for this course. Fee, $15. Thursdays,* 4 p.m., beginning *October 22.* Miss Shaw.

**B9. Economic Plants.**—Thirty sessions. The most important economic plants of the world are considered—their history, culture, formation of their useful products, and the extraction and preparation of the latter by man. Herbarium specimens and other material, as well as living plants in the conservatories and plantations of the Garden will be used for demonstrations. Because of its practical applications, this course will be of especial value to teachers. *Fee, $10. (Not offered in 1931–32.)* Dr. Cheney.

## C. Children's Courses

The following courses are open to all boys and girls. Enrollment in these courses entitles the boy or girl to membership in the Boys' and Girls' Club of the Brooklyn Botanic Garden. This club, having an active membership of about 1,000, meets twelve times a year for discussion of subjects related to plant life. Papers, by members, on various botanical and horticultural subjects, are read at these meetings, and the speakers are then entitled to a silver pin, providing they have satisfactorily completed courses of study at the Garden extending over at least six months. For information concerning Children's Room, the Children's Garden Building, and Children's Garden, see page 277.

**C1. Fall Greenhouse Work.**—The following courses are for both beginners and advanced students:

Class A.—Open to boys and girls who have never taken any greenhouse work before. *Saturday* mornings at 9:15. *Fee, fifteen cents. October 24 to December 19.*

Miss Miner and Miss Jenkins.

Class B.—Open to boys and girls over thirteen years of age who have had one year of greenhouse work. *Fee, fifteen cents. Saturday* mornings at 9:15, *October 24 to December 19.*

Miss Miner.

Class C.—Open to boys and girls who have been in at least two fall greenhouse classes before this. Time of class, 10:30, *Saturday* mornings. *Fee, fifteen cents. October 24 to December 19.*

Miss Dorward.

Class D.—Open to any boy or girl. Subject: the making of garden Christmas presents. *Saturday* mornings at 10:30. *Fee, fifteen cents and cost of materials. October 24 to December 19.*

Miss Dorward, Miss Miner, and Miss Jenkins.

Class E.—Silver Pin work as applied to greenhouse and garden work. The members of this class will be selected from students eligible for this work. Given in January and February, 1932. *No fee.*

Miss Dorward.

**C3. Preparation for the Outdoor Garden.**—The following classes are open to boys and girls during the spring of each year. The courses are planned for a better understanding of plant life and so that the outdoor garden may become a more intelligent piece of work. On account of limited space in the Children's Greenhouse, classes are limited to twenty. The fee for each course is *fifteen cents* to cover the cost of material.

Boys' Spring Course.—(a) *Saturday* mornings, 9–10:15, *March 5 to April 30.* (b) *Saturday* mornings, 10:30–11:30, *March 5 to April 30.*

Miss Dorward and Miss Miner.

Girls' Spring Course.—(a) *Saturday* mornings, 9–10:15, *March 5 to April 30.* (b) *Saturday* mornings, 10:30–11:30, *March 5 to April 30.*

Miss Miner and Miss Jenkins.

**C4. Advanced Work for Older Boys and Girls.**—How to raise plants, mix soils, transplant, start seedlings for outdoor gardens, etc. Boys and girls who have taken spring courses under

C5 are eligible for advanced work. The fee for the course is *twenty-five cents*. Each student may take home his plants and seedlings. This course is open to both boys and girls over twelve years of age. *Saturday* mornings at 9:30, beginning *February 6*.

Miss Dorward.

**C5. The Beginners' Garden.**—Open annually to 50 boys and girls who have never had instruction in gardening at the Brooklyn Botanic Garden. This course takes up the subject of the small garden, what to plant, how to plant it, care, replanting, etc. *Application for plots should be made in person or in writing before March 5.* Size of plots 8 ft. by 10 ft. All crops belong to the individual. *Fee twenty-five cents. Saturday* mornings, 9–12, *May 7 to October 1.*

Miss Shaw and Assistants.

**C6. Second Year Gardens.**—Open to 75 boys and girls who have had one or more seasons at the Brooklyn Botanic Garden—a continuation of Course C5. Registration should be made before January 1 of each year for the ensuing year. *Fee, twenty-five cents. Saturday* mornings, 9–12, *May 7 to October 1.*

Miss Jenkins and Assistants.

**C7. Junior Garden Assistants.**—Open to older boys and girls, or to those who have mastered Courses C2 and C4. Size of plot 10 ft. by 20 ft. These gardens are for the raising of vegetables. The work is in the nature of a project, "How much can one raise on a plot 10 ft. by 20 ft.?" Hours to be arranged. The student must put in at least two periods a week during the summer vacation, and, if possible, three. Registration date: *April 2. Fee, fifty cents.*

Miss Dorward.

**C9. Nature Study for Boy Scouts, Girl Scouts, Camp Fire Girls, Scout Leaders, and Others.**—Short courses of at least four periods each, with talks, demonstrations, and field trips in the grounds of the Botanic Garden and Prospect Park to study trees, shrubs, etc. The instruction and schedule dates will be adapted to meet the needs of the various groups that apply. *Open only to groups of at least ten persons.* Hours to be arranged. *No fee.*

Dr. Graves, Miss Miner, and Assistants.

**C10. Special Work for High School Pupils.**—A course in gardening or greenhouse work adapted for high school pupils.

Classes to be arranged for by the high school teacher. *Fee for materials used.* Miss Shaw and Assistants.

## D. Course for Student Nurses

**D1. General Botany With Special Reference to Medicinal Plants.**—A course of conferences, demonstrations, and field trips for student nurses. The general principles governing the life of plants, as well as the use and care of flowers in the sick room will be considered. Special attention will be paid to the identification of officinal plants in the field. Hours to be arranged. *No fee.* Dr. Graves.

## E. Consultation and Independent Investigation

### 1. *Consultation*

Consultation and advice, and the facilities of the laboratories, library, and herbarium are freely at the service of members of the Botanic Garden and (to a limited extent) of others with special problems relating to plants or plant products, especially in the following subjects:

1. **Plant diseases** (phytopathology) and classification of fungi (mycology). Dr. Reed.

2. **Plant geography** (phytogeography) **and ecology.** Dr. Svenson.

3. **Classification and identification of flowering plants** (systematic botany). Special groups studied in the Garden, supplemented by herbarium studies. Dr. Gundersen.

4. **The growing of cultivated plants** and their arrangement; also their adaptation to soils, climate, and other factors (horticulture and and gardening). Mr. Free.

### 2. *Investigation* *

For the following research courses, open to those properly qualified for independent investigation, there is a charge covering all

* Courses of graduate rank offered by the Botanic Garden, when approved by the Faculty of the Graduate School of New York University, are listed as courses in the Graduate School, and are given the same credit as other graduate courses. Properly qualified students who take these courses may

expenses, including laboratory fee, of *$30 for each full course* of 100 credit hours, and *$20 for each half course* of 50 credit hours.

**E6. Research in Mycology and Plant Pathology.**—Independent investigation of problems relating to fungi and fungous diseases of plants. Dr. Reed.

**E8. Research in Forest Pathology.**—Independent investigation of the diseases of woody plants. Dr. Graves.

**E9. Research in Systematic Botany of the Flowering Plants.** Dr. Gundersen and Dr. Svenson.

## VI

## MISCELLANEOUS

### Press Releases

In order to keep the public informed of events at the Garden, news items are sent at fairly regular intervals to the metropolitan dailies and to many of the suburban papers. These news releases consist of announcements of the periods when the principal floral displays are at their best, of the acquisition of new plants, the blossoming of rare species, improvements in the plantations, the installation of new collections and exhibits, the results of research and exploration, etc. The commencement of the various public courses, as well as public lectures and meetings of various societies at the Garden, are also announced through the public press. Circulars descriptive of the various courses and lectures are distributed, without charge, according to a regular mailing list and sent to all the libraries and schools of Greater New York. Requests to be placed on this mailing list should be addressed to the *Curator of Public Instruction*.

### Popular Publications

The publication of the Brooklyn Botanic Garden *Leaflets* commenced in 1913. Approximately ten numbers—sometimes more—constitute a Series, one series being issued each year. The current series is Number XIX. At the end of every four years,

present them in satisfaction of the requirements for advanced degrees given by the University. Graduate credit has also been allowed elsewhere for such advanced work done at the Garden.

for convenience in binding, a table of contents of the *Leaflets* published during the four year period is issued.

The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to present popular information about plant life in general for teachers and others. The *Leaflets* are free to members of the Garden and (on request) to teachers in the schools of Greater New York. For others, the subscription is 50 cents per year, or 5 cents a number (4 pages), double or triple numbers (8 or 12 pages) at the same rate.

Besides the *Leaflets,* numerous popular articles on various phases of plant life and gardening are written by members of the staff for publication in periodicals and newspapers.

## Guide Books, Maps, and Souvenir Postcards of the Garden

For those who wish to become acquainted with the various features of the plantations, including the general plan of the systematic section and the nature and location of the various types of special gardens, a guide book is now available entitled "Gardens Within a Garden: a General Guide to the Grounds of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, **18:** 153–188. May, 1929.) "The Story of Our Metate: a Chronicle of Corn" (Brooklyn Botanic Garden Record, **18:** 283–307. December, 1929.) is the title of another guide which gives an illustrated account of the ancient metate (now used as a bird bath) at the northern end of the Rose Garden. "The Japanese Garden of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, **19:** 197–234. July, 1930.) copiously illustrated, outlines briefly the history of Japanese Gardens and explains the meaning of the various features of the Brooklyn Japanese Garden. "The Rock Garden of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, **20:** 187–241. May, 1931.) includes a general discussion of rock gardening, with suggestions for construction and planting, as well as a chronological guide to the Rock Garden, in which the characteristic flowers of each month are described.

These guides have been mailed free to members of the Garden, and the first three are on sale at 25 cents each. The price of the

Rock Garden guide is 35 cents. By mail, 40 cents. Other guides, descriptive of other special features of the Garden, will be issued later.

A detailed map of the Garden, showing not only the various types of gardens included in the Botanic Garden area, but especially the location of the various orders and families in the Systematic Section, is appended to the General Guide. Copies are on sale at 5 cents each.

A colored picture map of the Garden, 7½ x 3½ feet, designed and executed by Miss Helen Sewall, is on view in the Laboratory Building. This map was presented to the Garden at the Annual Spring Inspection, May 14, 1929, as a memorial to the late Dr. Glentworth R. Butler by members of the Woman's Auxiliary and other friends of Dr. Butler. Photographs of this map (in black and white) may be had at 20 cents each.

Souvenir postcards, in colors, may be had at 15 cents a set (6 cards); two for 5 cents; 3 cents each. The subjects are: Scene in the Children's Garden: The Brook; Daffodils in the Lawn; The Lake; Children's Building and Formal Garden; The Rock Garden (Waterfall and Iris); The Japanese Garden (Wisteria); Inflorescence of Sago Palm.

**Orders** for guide books, maps, and souvenir postcards, accompanied by remittance, should be sent to *The Secretary*. These articles may also be obtained at the Information Desk in the Laboratory Building.

## VII

## OTHER EDUCATIONAL FEATURES

### Plantations

The plantations comprise the following sections:

1. General Systematic Section (trees, shrubs, and herbaceous plants arranged according to orders and families).
2. The Local Flora (native wild flower garden).
3. Ecologic Garden.
4. Rock Garden.
5. Japanese Garden.
6. Rose Garden.

7. Iris Garden.
8. Water Gardens.
9. Children's Garden.
10. Shakespeare Garden.
11. Horticultural Garden.
12. Experimental Garden.
13. Nursery.

As noted under *Docentry,* arrangements may be made for viewing the plantations under guidance. They are open free to the public daily from 8 a.m. until dusk; on Sundays and holidays from 10 a.m. until dusk.

## Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of fiber hats), fig, grapevines from north and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, black pepper, annatto (used in coloring butter and cheese), cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

It may be of interest to teachers that the nine extant genera of cycads are now represented in House 12. During the year, *Stangeria parodoxa,* from Natal, has been added, thus completing the collection. To reach the cycad house take the first door to the *left* after entering the central or Economic House and pass through to the end house.

The Conservatories are open April 1 to October 31, 10 a.m.–4:30 p.m. (Sundays, 2–4:30); November 1 to March 31, 10 a.m.–4 p.m. (Sundays 2–4).

## Herbarium

The Garden herbarium consists at present of about 190,000 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algae, and myxomycetes. This

collection may be consulted from 9 a.m. until 5 p.m. by those interested, and specimens submitted will be gladly identified.

## Library

The rapidly growing library of the Garden comprises at present more than 16,000 volumes and more than 12,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). More than 900 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe, the bulletins, monographs, reports and other publications of various departments of the United States Government, as well as those of foreign governments; of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens and other scientific institutions of the world, as well as the files of independent journals devoted to the various phases of plant life. The library is especially rich in publications of foreign countries and has a growing collection of incunabula and other pre-Linnean works.

Bibliographical assistance is rendered to readers by members of the Library staff.

## Laboratory Building

The Laboratory Building contains (besides offices of administration and the Library and Herbarium mentioned above) four laboratory rooms, a culture room, three classrooms with stereopticon and other equipment for instruction, a room for the installation of temporary exhibits, six private research rooms, and an auditorium seating about 570 and equipped with motion picture machine, stereopticon and lecture table supplied with water, gas, and electric current for lectures involving experimental work.

## Instructional Greenhouses

A range of three greenhouses, each about 20 x 30 feet, is provided for the practical instruction of children and adults in plant propagation and other subjects.

## Children's Room

A gift of $1,500 in 1921 from Mrs. Helen Sherman Pratt, supplemented in 1923 by a further gift of $500 from Mr. George D. Pratt, has made it possible to provide a beautifully decorated room for the use of the Boys' and Girls' Club. Any boy or girl who is enrolled, or has been enrolled, in any of the children's classes at the Garden is eligible for membership in this club, which now numbers about 1,000 active members. The room contains shelves for a nature-study library, of which a nucleus has already been secured, and is equipped with stereoscopic views, photographs, and preserved and living specimens of plant life, for the instruction and entertainment of boys and girls. The room is open free to all children. Contributions of specimens and of books on nature study and closely related subjects will be most welcome.

## Children's Garden Building

This is located in the northern part of the Children's Garden plot and contains a conference room, and rooms for the storage of garden tools and implements. The furniture in the conference room was a gift from Mrs. James H. Post. Various collections of plants, seeds, and insects of economic importance in the garden are accessible here for consultation by the children. A garden library, a gift of friends, has been added. North of the Children's Building is a plot planted to ornamental shrubs and herbaceous perennials for the instruction of the children.

## Children's Garden

A plot of about three quarters of an acre in the southeast part of the Botanic Garden is devoted to the theoretical and practical instruction of children in gardening. The larger part of this area is laid out in garden plots which will accommodate about 150 children.

## Rose Garden

The Rose Garden, occupying about one acre in the northwest part of the Botanic Garden, was formally opened to the public on Sunday afternoon, June 24, 1928. This garden was made possible by a gift of $10,000, later increased to $15,000, from Mr. and Mrs. Walter V. Cranford, of Greenwich, Connecticut.

The general plan of the Garden is as follows. At the north end, entrance is gained through a Doric pergola. Three parallel rows of beds extend to the southward from the pergola, as far as the pavilion. In the central row of beds, varieties of hybrid perpetuals have been planted along with many of the small *polyantha* type; each of the two side rows contains varieties of hybrid teas. In the location of these varieties the older forms appear at the beginning, near the pergola, the most recent productions near the pavilion, with the intermediate forms in chronological sequence between. Varieties of pillar and post roses are planted at regular intervals, on suitable supports, in the beds, with standards between the beds of the side rows. The trellis surrounding the garden as well as the pergola and pavilion furnishes support for climbing roses, while the marginal beds along the trellis are for wild species and their derivatives. South of the pavilion, three additional beds are devoted to historical roses, *i.e.*, those mentioned in ancient literature, and to roses of commercial use.

The Rose Garden is open to the public from 1 to 5 on weekday afternoons, except holidays. Children are admitted only when accompanied by responsible adults.

## Japanese Garden

The Japanese Garden, first opened to the public in 1915, was a gift to the city from Mr. Alfred T. White, "the father of the Botanic Garden." Designed by the Japanese architect, Mr. T. Shiota, it represents truly the Japanese idea of a garden. From the tea house (near the east entrance) one can see the *machiai* or "rest house," the island with the drum bridge, bronze storks, stone and wooden lanterns, the waterfalls, and the wooden Torii standing in the lake. For details and explanations of the meaning of the various features see "The Japanese Garden of the Brooklyn Botanic Garden" (Brooklyn Botanic Garden Record, **19**: 197–234. July, 1930.) This garden has been enclosed by a "woven wood" fence, of chestnut poles, imported from France. This fence was presented by a friend of the Botanic Garden. During the past year a new bridge has been built near the base of the waterfalls, replacing the old structure, and other additions and improvements have been made.

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*59. Hybrids of Iris fulva and Iris foliosa.* 10 pages. 1 colored plate. 1931.

*60. The Iris of Japan.* 48 pages. 1931.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the *Record;* see above.

*Guide No. 3. The story of our metate: A chronicle of corn.* Illustrated. Published, December, 1929. Price, 25 cents.

*Guide No. 4. The Japanese Garden.* Illustrated. Published, July, 1930. Price, 25 cents.

*Guide No. 5. The Rock Garden.* 28 illustrations. Price, 35 cents. By mail, 40 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

AMERICAN JOURNAL OF BOTANY. Established, January, 1914. Published, in coöperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription, $7.00 a year. Circulates in 48 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

BROOKLYN BOTANIC GARDEN RECORD

VOL. XX NOVEMBER, 1931 NO. 6

# JAPANESE POTTED TREES (HACHINOKI)

## GUIDE No. 6

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FIG. 1. Neagari, or Uprooted Dwarf Pine. (6181)

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# JAPANESE POTTED TREES (HACHINOKI)

By Bunkio Matsuki

The vogue for cultivating potted trees in Japan may be traced back to the early Fujiwara period (about 1000 A.D.). In English books these plants are usually referred to as "dwarf trees," but this term is never used in Japan as they are always given the name of "potted tree"—the older word used is *Hachinoki,* and the more modern one *Bonsai.*

The first mention of Hachinoki appears in the Ashikaga dramatized literature; an incident in the Kamakura era in the village of Sano, in North Japan, is depicted in a well-known "No play." On one stormy, snowy night Hojo Tokiyori, the Regent of the Shogun, in disguise as a Buddhist monk, asked for shelter in the house of a poor farmer. The owner at first refused because of his poverty, but the traveling monk insisted on shelter for the one night. Alas, there was no wood to burn in order to combat the cold except three potted dwarf trees—pine, plum, and cherry. The poor farmer sacrificed these for the comfort of his honored guest. The host turned out to be Genzaemon Sano, a famous Samurai, who was ruined and sunken in the world on account of being dispossessed of his property during his absence on war service by a selfish relative. The traveling monk departed the next morning without disclosing his identity. However, as soon as he reached Kamakura he summoned Sano and restored to him all his former estates and, in addition, three districts bearing the names of pine, plum, and cherry. This lyric drama is still played far and wide in Japan, and many Japanese feel a romantic glamor in keeping Hachinoki in their possession.

The Japanese people delight in landscape gardens, and many large ones have been developed in various parts of Japan. Potted

FIG. 2. *Matsu*, or Japanese Pine. This specimen is planted in a Tokonabe flower pot. The trunk and branches are elaborately trained and the age of the specimen is about twenty-five years.

The pine tree is very popular in Japan, and is widely cultivated for the *Bonsai* (potted plants or trees). It is often associated with the bamboo (*Take*) and plum (*Ume*). The Chinese pronunciation for these three plants is *Sho, Chiku,* and *Bai.* The pine is a symbol for unchanging, the bamboo for straight-forwardness, and the plum for perseverance and fragrance. The combination of the three is considered an auspicious grouping, and their *Bonsai* are favorite decorations for weddings, birthdays, and longevity parties. (6180)

trees also give to the Japanese the pleasure of a miniature landscape panorama, and beautiful trained specimens create a similitude of an ancient arbor. There are four seasons of the year in which potted trees are especially in evidence. In various cities in Japan Hachiuye dealers display many hundreds of specimens in vast gardens

FIG. 3. *Hiba* (*Chamaecyparis obtusa*). This specimen is in a Seiji porcelain flower pot. The specimen is about fifty years old. The dwarf *Hiba* is very much admired in Japan, as it is one feature of the tree to convey the idea of an ancient arbor. (6179)

for their clients to select from. Collectors of the plants are very numerous, among them being men of rank and letters, politicians, merchants, and others. Some collections are extremely valuable, frequently being sold for many thousands of dollars.

The varieties of trees used for potted specimens are very numerous. Many species of pine, cedar, hiba, oak, plum, wisteria, maple, cherry, gingko, azalea ivy, bamboo, and shrubs are very popular. In Tokio and other places there are often beautiful ex-

hibitions of potted plants, for well-known collectors send some of their prized specimens. The writer once enjoyed seeing an exhibit in autumn in Tokio where more than two hundred specimens were displayed. One of the most artistic and exquisite was a rectangular shallow jardinier, not larger than fourteen by eight inches,

FIG. 4. This is another specimen of *Hiba,* and is planted in another type of Seiji porcelain pot. The age of this specimen is over forty years. This style of dwarf tree is known as Uprooted Hiba or *Ne-agari Hiba.* The cypress is one of the favorite evergreen trees in Japan, being especially admired by the artists. A number of the great master painters of the Kano school have portrayed it in Kakemonos, screens, and sliding doors. (6178)

in which there were planted five dwarf gingko trees not more than a foot in height. The gnarled trunks and boughs suggested every appearance of ancient arbors while the foliage, the size of clover leaves, turning into various hues of brilliant yellow enhanced the

specimen, suggesting glimpses of perfect autumnal gingko groves. Another jardinier which still lingers in my memory was a dwarf ivy of five shades, known as *Goshiki-tsuta.* Its tiny foliage gave gorgeous autumnal hues from various yellows to brilliant crimson.

## How To Train Dwarf Trees

There are various methods of training plants in order to give to them the appearance of ancient arbors. Japan is rich in mountains

Fig. 5. *Kashiwa,* or White Oak. This specimen is planted in a Mino pottery jar. The age of this specimen is about sixty years. Since ancient times the oak and pine are two favorite kinds of trees. The oak is not evergreen, but is greatly admired on account of its leaves which, although dead and brown, remain on the branches throughout the winter, thus indicating persistence and fortitude. The pine tree is evergreen and fragrant, and these two trees are utilized as symbols of good omens for decoration at birthday parties and wedding day ornaments on porches and verandas. (6183)

and hills with abundant trees and shrubs growing wild. Often those who train specimens roam over certain areas of the mountains and ravines which are little accessible to ordinary travelers, in search of suitable young trees, and begin the training of the trees in their natural habitat. Later the undesired portions of the shoot

FIG. 6. This is another specimen of *Kashiwa* in Chinese pottery jar, and is about sixty years old. (6184)

are cut away and the entire plant is dug up. These uprooted plants are known as *Neagari*, or uprooted dwarf trees. The dwarf pine tree illustrated in Figure 1 is an example. In some cases a small artistically shaped stone is placed so that the partly bent trunk and root embrace it. Spring and autumn are the most suitable seasons in which to begin the training of the trees, and they are kept for a year or two in their natural soil, the trainer paying many a visit to the site.

FIG. 7. *Tsutsuji,* or Azalea. This plant is called *Kirishima Tsutsuji* in Japan. It is a very rare potted tree or *Bonsai* in this country. This specimen is planted in a Shigaraki pottery jar. The age of the specimen is over one hundred and twenty-five years. The massive short trunk is suggestive of an ancient gnarled stump and measures sixteen inches in circumference. It is provided with a myriad of offshoots which bear beautiful pale pink flowers during the month of June. The flowers are much smaller than in the *Satsuki.* (6176)

Some growers have a large space in their gardens in which they train the trees in pots or in the soil. The trunks and branches must be twisted in order to produce the desired gnarled effect. The method varies according to the kind of tree, but in the case of the pine and hiba several longitudinal cuts about two and a half

inches in length are made around the column of the trunk or branch. The stems are then gently twisted and tied with soft copper wire or, better, with wisteria twine. It requires great skill to make the scar as invisible as possible, for the value of the specimen is greatly lowered if the scars are very pronounced.

FIG. 8. *Tsutsuji,* or Azalea. This specimen, in a Shigaraki pottery jardinier, is about fifty years old. (6378)

The operations on the trees must be performed during the early forenoon, for it is believed that at that time there is less likelihood of the stem or branch breaking off. In order to facilitate the work, the trainer applies a solution of *Funori,* a Japanese glue, made from the marine alga, *Gloiopeltis furcata.* This softens the stems,

makes them more tender, and thus facilitates the twisting with less chance of the breaking the trunks and branches.

The trees are planted in jardinieres of various types. Frequently these are extremely valuable. Along with the trees, various stones are placed, increasing the artistic value. If the stone has a very fine patina its value is naturally much greater.

FIG. 9. *Tsutsuji*, or Azalea. This plant, also in a Shigaraki pottery jardinier, is known in Japan under the name of *Satsuki*. The flowers are much larger than in the *Kirishima* variety. The specimen is more than one hundred years old. (6229)

The plants are cultivated in earthen pots and can easily be moved about when it is desired to observe them. It is better to keep them in porous unglazed pottery (*Suyaki* pots) of a suitable size so that they can be transferred to the choice valuable pot when the occasion arises. The soil is changed yearly in the spring, and care must be taken not to overfertilize it. A small portion of manure

FIG. 10. *Tsutsuji,* or Azalea. The specimen, a Satsuki variety in a Shigaraki pottery jar, is about forty years old. (6175)

is mixed with ordinary loam. Pebbles or broken bricks are placed over the drainage holes in order to facilitate the drainage.

## SPECIMENS IN THE CONSERVATORIES OF THE BROOKLYN BOTANIC GARDEN

The potted Japanese trees described under the following illustrations were the generous gift to the Brooklyn Botanic Garden from Mr. Ernest F. Coe, then of New Haven, Conn. There were 32 trees and shrubs, representing 21 species, imported from Japan by

Mr. Coe. They were received on June 5, 1925, in their original Japanese containers. The collection included Pines, Junipers, Cypress, Oaks, Maples, Aucubas, Skimmias, Palms, Azaleas, Wiste-

FIG. 11. This jar contains Azalea, Maple, and Dwarf Elm. The square jar is of Shigaraki pottery. When dwarf trees are planted with shrubs in one dish it is called *Uyekomi Bonsai* or Potted Dish in Variety. The Elm is called *Yenoki* in Japan, and ranks next to the Oak in favor. The Azalea (*Tsutsuji*) and Maple (*Momiji*) are considered suitable for cultivation in one dish. The specimens in this pot are approximately twenty-five years old. (6177)

ria, Euonymus, Bamboo, and Ilex. The gift was acknowledged on pages 48 and 100 of the Fifteenth Annual Report of the Garden, 1925. (Brooklyn Bot. Gard. Record **15**: 48, 100. April, 1926.)

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59. *Hybrids of Iris fulva and Iris latifolia.* 10 pages, 1 colored plate. 1931.

60. *The Iris of Japan.* 46 pages. 1931.

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